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WAGENER (W. W.). **Diseases of Cypresses.**—*El Aliso, 1948*, 1, pp. 255–321, 8 pl., 1948.

In this comprehensive study on the diseases of *Cupressus* the author states that galls, caused by *Gymnosporangium cupressi* [*R.A.M.*, xx, p. 2] were found in two restricted localities in Arizona on *C. glabra* and *C. arizonica*. Old planted native Monterey cypresses [*C. macrocarpa*] at several points in California show quite commonly a brown, friable pocket rot of the heartwood, probably caused by *Polyporus basilaris* [cf. ibid., xxi, p. 313]; the same host is also being attacked by *P. cutifractus*. Crown gall (*Phytomonas* [*Bacterium*] *tumefaciens*) [ibid., xv, p. 138] occurs on *C. arizonica* in cultivated ground, but inoculated *C. glabra* failed to develop galls. The latter species is moderately susceptible to Texas root rot (*Phymatotrichum omnivorum*). *Armillaria mellea* has been found on native Tecate cypress [*C. forbesii*] and occasionally attacks Monterey cypresses in California. *Phomopsis juniperovora* [ibid., vi, p. 328] has been isolated from several species of cypresses in the United States, but causes no serious damage in south-western States, probably owing to the lower humidity during the growing season in that part of the country.

Most of the work on *Coryneum* canker (*C. cardinale*) [ibid., xxvii, p. 452], the most destructive of the *Cupressus* diseases, has already been noticed, but the following may be mentioned: the fungus has been isolated from *C. abramsiana*, *C. arizonica*, *C. forbesii*, *C. goveniana*, *C. lusitanica*, *C. macnabiana*, *C. macrocarpa*, *C. pygmaea*, *C. sargentii*, *C. sempervirens stricta*, *Thuja orientalis*, *T. plicata*, *Libocedrus decurrens*, *Juniperus chinensis femina*, and in New Zealand from *Chamaecyparis lawsoniana*. *Coryneum cardinale* differs from all the five species of *Coryneum* with 5-septate spores which have been found on conifers. In California, in addition to these, a 5-septate species occurs on *Cupressus macrocarpa* as a saprophyte, and another which causes cankers on the Coast Redwood [*Sequoia sempervirens*]. Inoculations with the latter pathogen induced cankers in *C. macrocarpa*.

The optimum temperature for growth of *Coryneum cardinale* is about 26° C., the minimum slightly below 5°, and the maximum about 34°. The optimum temperature for the saprophytic species of *Coryneum* is about 18°. In dry, protected situations spores may retain their viability for many months. On exposed leaves they still showed 29 per cent. viability after 48 days. Based on the results of numerous field tests, the New World cypresses and other conifers were arranged in five groups according to their probable susceptibility in the field; *Cupressus macrocarpa* is listed as the most susceptible; *C. arizonica*, *C. bakeri*, *C. glabra*, *C. guadalupensis*, *C. stephensonii*, and species of other genera as not susceptible; and *C. forbesii*, *C. nevadensis*, and the other hosts from other genera as slightly susceptible. Inoculation results did not provide a reliable indication of susceptibility in the field.

No effective control has been devised yet, as the pathogen penetrates deeply (10 mm.) into the wood. A Bordeaux spray (4–2–50) with a spreader adhesive was found effective in reducing the number of new infections in windbreaks of

C. macrocarpa and thereby served to prolong their life. Several *C. macrocarpa* trees showed some resistance to the disease and they may provide a future source of acceptable planting stock, either through vegetative propagation or breeding.

BERK (S.). **Inoculation experiments with Polyporus schweinitzii.**—*Phytopathology*, xxxviii, 5, pp. 370–377, 2 figs., 1948.

Polyporus schweinitzii [*R.A.M.*, xxvi, pp. 273, 433] is considered primarily as a wood-destroying fungus that causes a root and butt rot of conifers and has been active in some forest plantings of white [*Pinus strobus*] and red pine [*P. rubra*] on the watershed of Hemlock and Canadice Lakes, New York State, for at least 15 years. Since the disease is so widespread, a series of experiments were undertaken to determine whether the fungus can parasitize the roots of various seedling hardwoods and herbaceous plants.

The results showed *P. schweinitzii* to be incapable of parasitizing the roots of hardwood seedlings under the conditions of the test and capable of only weakly parasitizing the roots of lupin and bush beans [*Phaseolus vulgaris*] grown under aseptic conditions on inoculated ground pine-needle duff saturated with 2 per cent. malt. This medium gave apparently favourable environmental conditions for the fungus but not for the host. The possibility that the organism may remain viable in agricultural soils for some time after the land has been cleared, especially when the soil is rich in humus materials, cannot be precluded.

The fungus can survive and grow rapidly in certain types of sterilized soil but species of *Fusarium*, *Penicillium*, and other fungi isolated from the roots grew more rapidly than *P. schweinitzii* in culture and it is possible that inoculation of the last-named may be completely overgrown by the former species before infection can be effected.

BOUDRU (M.). **La maladie du Sapin de Douglas et d'autres conifères, causée par Phomopsis pseudotsugae Wilson.** [The disease of Douglas Fir and other conifers caused by *Phomopsis pseudotsugae* Wilson.]—*Bull. Soc. for. Belg.*, lv, 6, pp. 193–201, 1 pl. (facing p. 202), 1948.

In this paper (written in October, 1945) the author gives a semi-popular account, based largely on the literature of the subject, of the disease of Douglas fir (*Pseudotsuga taxifolia*) and other conifers caused by *Phomopsis pseudotsugae* [*R.A.M.*, xix, p. 178]. Up to the time of writing, the fungus had not been observed in Belgium either by workers at Gembloux or by those at Groenendael [ibid., xxvi, p. 367].

SCHEFFER (T. C.). **Chemical dipping treatments for controlling molding and staining of wood boxes and crates.**—*Spec. Release Div. For. Path., U.S. Dep. Agric.*, 28, 16 pp., 1 pl., 1946. [Mimeographed. Received June, 1948.]

The results are given of surface applications of 109 solutions of single and mixed chemicals made for both mould and blue stain control to panels of pine and sweet gum [*Liquidambar styraciflua*] sapwood afterwards held in damp storage for two months. The fungi used (in spore suspension) for the inoculations were species of *Aspergillus*, *Penicillium*, *Trichoderma*, *Mucor*, *Ceratostomella*, and *Diplodia*. Much natural inoculum was also present, and much staining was due to *Hormiscium gelatinosum* [*R.A.M.*, xxi, p. 436], which was not applied artificially. The chemicals were applied in water and in organic solvents, chiefly solvent naphtha.

Leaching the treated wood for four hours in quiet tap water did not appreciably reduce control. Of the aqueous treatments, the most promising were: sodium pentachlorophenate 5 per cent.; sodium pentachlorophenate+borax, 2+2 per

cent.; sodium pentachlorophenate+borax+phenyl mercuric oleate (in emulsion), 1+1·5+0·1 per cent.; sodium pentachlorophenate+borax+ethyl mercuric phosphate, 1+1·5+0·032 per cent.; and, possibly, sodium pentachlorophenate+ethyl mercuric phosphate, 2+0·032 per cent. The mixtures would probably cause less dermatitis than the 5 per cent. sodium pentachlorophenate alone and would be much less expensive. Probably, also, they would be more effective where species or strains of fungi prevailed which were more than usually tolerant of the phenate alone. The evidence indicates that with mixtures of sodium pentachlorophenate and borax little is gained by using a borax concentration of over 1·5 per cent.

Aqueous treatments only slightly less effective were: sodium pentachlorophenate+borax, 1·5+1·5 per cent.; sodium pentachlorophenate+borax+ethyl mercuric phosphate, 1·5+1·5+0·008 and 1+1·5+0·016 per cent.; and, possibly, (alkyl quaternary) ammonium pentachlorophenate, 0·8 per cent. Aqueous materials that were less effective but likely to give reasonably good control under drier conditions were: sodium pentachlorophenate, 2 per cent.; and sodium pentachlorophenate+borax, 1+1·5 per cent.

The outstanding chemicals used in organic solvents were: pentachlorophenol, 5 per cent., and 8-hydroxyquinoline, 2 per cent. The latter is too expensive for general use but might be considered for treating fresh-food containers. Less effective but giving substantial control were: pentachlorophenol, 2 per cent.; copper naphthenate (2 per cent. copper); zinc napththenate (2 per cent. zinc); and iron naphthenate (2 per cent. iron).

As none of the tests was maintained for more than two months, the results are tentatively regarded as applicable primarily to containers made of unseasoned wood, which will have an opportunity to dry out in a few months, or to those exposed to external wetting for short periods only.

Englerth (G. H.). **Decay of Sitka Spruce in south-eastern Alaska.**—*J. For.*, xlv, 12, pp. 894–900, 2 figs., 1947.

The results are given of a study of decay and other defects in Sitka spruce [*Picea sitchensis*] carried out in south-eastern Alaska in the latter part of 1942 and in July and August, 1943 [cf. *R.A.M.*, xxv, p. 531]. Additional data were obtained at mills in Alaska and the State of Washington, where Alaskan Sitka spruce was being sawn into lumber. Of a total of 595 trees studied on nine plots, 148 were infected. In addition, 35 decayed trees were examined on two further plots. Most of the decay was caused by 12 species of fungi, some of which caused a brown cubical or carbonizing rot, while the remainder produced a white or non-carbonizing rot. The fungi causing brown rots were the most important cause of cull. These were *Polyporus schweinitzii* [ibid., xxvi, pp. 223, 273], *P. sulphureus* [ibid., xxii, pp. 187, 231], *Fomes pinicola* [ibid., xxvii, p. 105], *F. officinalis* [ibid., xxiv, p. 472; xxv, p. 523; xxvi, p. 258], *Lentinus kauffmanii* [ibid., xxvi, p. 223], and *Trametes serialis* [ibid., xxv, p. 143]. Those causing the white rots were *F. pini* [ibid., xxvii, p. 207], *F. nigrolimitatus* [ibid., xxvi, p. 272], *F. applanatus* [*Ganoderma applanatum*: ibid., xxvi, pp. 429, 567], *P. borealis* [ibid., xxii, p. 187], *P. picipes* [ibid., xvi, p. 358], and *Poria subacida* [ibid., xxvi, pp. 272, 274].

A white rot caused by *Hydnum abietis* was found once, during a mill study, though it was not observed in spruce in the woods. Limited observations on western hemlock [*Tsuga heterophylla*] indicated that this fungus is one of the most important causes of decay in this species in south-eastern Alaska.

In Sitka spruce more rot was caused by *Polyporus schweinitzii* than by any other fungus, the figure being 75 out of a total of 213 infections. It occurred on all plots, and, in general, in trees over 300 years old, about one in six was infected by it. *P. borealis* caused 41 infections, or about 20 per cent. of the total. *F. pinicola* caused 28 infections, and *P. sulphureus* 23. *F. pini* occurred in 11 cases, *F.*

officinalis occurred in seven, and *L. kauffmanii* in four. *F. nigrolimitatus*, though common on down Sitka spruce, was found only twice as a lower trunk rot of living spruce.

Rayner (M[abel] C.). **Behaviour of Corsican Pine stock following different nursery treatments (Pinus nigra var. calabrica Schneid.).**—*Forestry*, xxi, 2, pp. 204–216, 1 pl., 1 fig., 10 graphs, 1947 (issued 1948).

A full account is given of a planting experiment carried out to compare the survival and growth behaviour of Corsican pine (*Pinus nigra* var. *calabrica* Schneid.) seedlings raised on poor, infertile heathland (treated with compost) in Wareham Forest, Dorset, with that of others raised by standard nursery methods in a nursery 20 miles away. The treatments were: B, two-year seedlings, which had been raised by sowing in a compost-treated seed-bed on poor *Calluna* heath in Wareham Forest, lined-out for one year in similar soil treated with compost; D, two-year seedlings raised in a Forestry Commission nursery and lined-out for one year in the same nursery; and C, two-year seedlings raised by sowing as in B, and lined out for one year as in D. All treatments were duplicated at planting (in 1940), one series, B 1, C 1, D 1 receiving 2 oz. per tree of phosphate fertilizer (basic slag) at planting, the other, B, C, D being without soil treatment. The unit for each treatment consisted of six rows each of about 33 plants, of which three rows were planted without and three with phosphate. The plot units were randomized and each treatment quadruplicated. In all, about 2,400 plants were used.

The results, assessed one, two, three, and six years from planting, showed that in survival and in shoot growth, general health, and vigour the plants raised on poor heath soil with compost and lined-out in the same soil with compost were greatly superior to the corresponding plants raised and lined-out in a standard nursery of the Forestry Commission. The death rate of the latter in 1942 was 158, compared with 24 in B and 18 in B 1, and was increased to 180 by supplying phosphate at planting. Those raised in heath soil with compost and lined-out in the standard nursery occupied a median position. Phosphate at planting benefited growth of the surviving plants in all series, but B plants were at least as good as the C 1 series. The root systems of the B plants were well provided with clusters of short mycorrhizal roots of the normal ectotrophic type formed by association with *Boletus bovinus* [*R.A.M.*, xxiv, p. 463; xxvii, p. 211], and closely resembled those of naturally regenerating seedlings in a Corsican forest. This type of root system was noted in the field transplants two years after planting and was still present in root samples examined in 1947. It is believed to have played a decisive part in their observed growth reactions. The roots of the D plants, on the other hand, were non-mycorrhizal, a condition constantly recorded for Corsican and other species of pine and of spruce raised in the nursery in question. The non-mycorrhizal type of root system was feebly stimulated by phosphate treatment, but persisted in the D plants for two years after planting. Relative poverty in mycorrhizal equipment was still a feature of the D root systems at the time of writing. This difference in mycorrhizal behaviour is regarded as the most significant factor underlying the behaviour of the two sets of plants.

The C roots were intermediate in respect to mycorrhizal activity, but their response to phosphate at planting was markedly greater than in the D series, as expressed in improved shoot growth and mycorrhizal equipment.

This experiment shows that the constitutional vigour of Corsican pine seedlings raised in soil conditions that ensure a normal root system with adequate mycorrhizal equipment is carried into the forest, even when plantings are made in very poor soils of non-forest type. It follows that for this species (and, no doubt, others) the use of soil treatments to produce seedlings satisfying these requirements may be restricted to the nursery.

Săvulescu (Alice). **Eine neue Krankheit auf Carthamus tinctorius L. (Saflor) hervorgerufen durch Macrosporium carthami Săvul.** [A new disease of *Carthamus tinctorius* L. (Safflower), caused by the fungus *Macrosporium carthami* Săvul.]—*Bull. Sect. sci. Acad. roum.*, xxvi, 10, pp. 1–20, 8 pl., 11 figs., 2 graphs, 1944.

This work has been already noticed from another source [*R.A.M.*, xxv, p. 472].

Tims (E. C.). **White rot of Shallot.**—*Phytopathology*, xxxviii, 5, pp. 378–394, 4 figs., 1948.

Although white rot (*Sclerotium cepivorum*) [*R.A.M.*, xxiii, p. 512; xxvii, p. 7] of shallots, garlic, and onions in Louisiana is at present confined to a few small farms along the east bank of the Mississippi the disease constitutes a potential threat to these crops in the southern part of the State where they are grown in the cooler season of the year under conditions favouring its development.

The leaves of wilted shallot plants gradually turn yellow and collapse. The roots rot off at the crown, the basal portions of the scales soften and slough off, often forming a semi-watery decay similar to that caused by *Sclerotinia sclerotiorum* and a whitish-grey mycelium develops on diseased parts below the soil line, soon accompanied by small black sclerotia. When infection occurs late in the season the bulbs formed invariably decay soon after harvest. In Louisiana shallots are grown from September to May and the infection period is generally from December to March. Under certain conditions, shallot plants may become infected and die within 20 days.

Several strains of the fungus, mostly varying little in growth characters or pathogenicity, were isolated from diseased onion, garlic, and shallot plants. Two strains obtained from shallot varied considerably, A producing numerous sclerotia on Czapek's agar with a minimum of mycelium and B developing a heavy mat of white mycelium with a few sclerotia and growing more quickly than A. After transfers at monthly intervals for three years B developed several sectors and neither the original isolate nor its sectors proved parasitic on shallot in inoculation experiments although A produced typical white rot symptoms.

Most white-rot-infested soils in Louisiana are slightly acid (pH 5 to 6·3) but the fungus grew well on Bacto bean agar and Czapek's solution over a wide pH range. On Richards's solution, however, growth occurred only between pH 2 and 7. The addition of hydrated lime at 1,000 lb. or 1,500 lb. per acre in 1943 increased the percentage of healthy bunches of shallots from 58 in the control to 68 and 74, respectively. In the following year the addition of 1,500 lb. lime per acre reduced white rot in the early stages but after the shallots matured sufficiently for the market the disease rapidly invaded the weakened plants. Semesan (1 oz. per gal.) and mercuric chloride (1 in 500) applied to the soil reduced the number of diseased bunches produced from 96 out of a total of 140 to 2 out of 138, and 0 out of 137, respectively. Various fungicidal dusts were ineffective. No appreciable resistance to white rot was observed in any variety now grown in the State.

The most promising means of controlling white rot of shallots in Louisiana appears to be early planting (August to September) to enable the crop to be harvested in October or November before disease develops.

Capoor (S. P.) & Varma (P. M.). **Yellow mosaic of Phaseolus lunatus L.**—*Curr. Sci.*, xvii, 5, pp. 152–153, 1 fig., 1948.

In December 1939, at the Agricultural College Farm, Poona, India, numerous *Phaseolus lunatus* plants showed a leaf mosaic caused by a virus [cf. *R.A.M.*, xxv, p. 431]. The same disease also occurred at several places in the province. The leaves develop scattered, slightly discoloured patches, which gradually turn bright

yellow. Occasionally a whole leaflet becomes chlorotic. The affected plants are not dwarfed and continue to grow normally, but the pod production is greatly reduced. Inoculated seedlings in an insect-proof glasshouse developed symptoms after 20 days. The virus is readily transmitted by bud-grafting, but not by sap or seed. *Bemisia tabaci* (*B. gossypiperda*) was the only insect which transmitted the disease (30 infections from 30 plants inoculated).

The virus also infects *P. limensis*, *P. vulgaris*, *P. aureus*, *Dolichos biflorus*, and *Canavalia ensiformis*. Of the *P. vulgaris* varieties tested Asgrow Stringless Greenpod and Davis White Wax were found to be resistant, Red Kidney highly susceptible.

The mosaic is considered to be caused by a new virus and the name 'double bean yellow mosaic' virus is suggested.

Heiberg (Barbara C.) & Ramsey (G. B.). **Phoma rot of garden Beets.**—*Phytopathology*, xxxviii, 5, pp. 343–347, 1 fig., 1 graph, 1948.

For several years a black rot of topped garden beets [*R.A.M.*, xxvi, p. 90] in storage has caused heavy losses among rail and truck shipments on the Chicago market. The disease usually appears at the root tips but occasionally occurs at the crown and in wounds on the side of the root. The affected tissues blacken or develop a flat, greyish-white surface mycelium while internally the dark brown, water-soaked tissues, sharply divided from the healthy tissues, become black and granular and eventually dry and spongy. No pycnidia were observed but isolations made from the advancing edge of black rot lesions consistently yielded a species of *Phoma* and comparison with authentic cultures of *P. betae* [ibid., xxvii, pp. 3, 4] indicated that the same species was involved. On potato dextrose agar (pH 7) the garden beet organism produced abundant pycnidia ranging from 210 to 560 μ in diameter and conidia measuring 4·3 to 8·1 by 2·9 to 5·8 μ, average 5·7 by 3·5 μ. Cultures on potato dextrose agar (pH 7) grew through a temperature range of 35° to 95° F., the optimum being 75°. Wound inoculations in whole and sliced garden beets produced greater decay during storage in older beets than in young beets. Beets inoculated by the scalpel method and stored in moist sand for 6 weeks developed lesions averaging 5 mm. in diameter at 45°, 12 mm. at 55°, and 6 mm. at 65°. Different amounts of decay produced in sliced storage beet inoculated with 5 different cultures of *P. betae* from garden beets and 3 from sugar beets indicate that there may be some difference in pathogenicity between strains of the organism. In inoculation studies using seedlings grown in the greenhouse from seed of the Detroit Dark Red variety, tan leaf spots, 2 to 3 mm. in diameter, with red borders were produced on the older leaves of two-month old seedlings in covered pots two days after they had been atomized with a water suspension of spores of a garden beet isolate of *P. betae*. The fungus was re-isolated from these spots. In germination tests using three lots of commercial garden beet seed of the Detroit Dark Red variety, 20 to over 50 per cent. of the seedlings were killed, and, upon examination, were found to bear abundant pycnidia of *P. betae* which proved pathogenic to beets in inoculation tests.

Yu (T. F.) & Fang (C. T.). **Fusarium diseases of Broad Bean. II. Further studies on Broad Bean wilt caused by Fusarium avenaceum var. fabae.**—*Phytopathology*, xxxviii, 5, p. 331–342, 1 fig., 2 graphs, 1948.

In this paper the results of further studies at the National Tsing Hua University, China, on the broad bean wilt caused by a typical wilt producing strain, isolate No. 607–R–1 of *Fusarium avenaceum* var. *fabae* [cf. *R.A.M.*, xxiii, p. 422], are reported. The optimum temperature for mycelial growth on potato dextrose agar was 24° to 26° C., the minimum 5° to 6°, and the maximum below 33°. The fungus grew well on acid media ranging from pH 4·5 to 8·9, optimum growth being obtained

between pH 5·8 and 6·7. The organism also tended to increase the acidity of the medium on which it grew. Spores germinated most rapidly at temperatures near the optimum for growth of the mycelium, while abundant sporulation was observed from 10° to 28° with the optimum about 20°. The percentage of wilted plants was much higher in dry and medium-moist soils than in wet and saturated soils. Medium-moist soil favoured early development of the symptoms and dry soil caused rapid death of affected plants. Although no experiments to determine the effect of soil temperature on the development of wilt have yet been made, field surveys indicate that it is an important factor in limiting distribution and severity. The disease occurs throughout the bean-growing areas but it was far more prevalent and destructive in the northern part of Yunnan province than in the southern part where soil temperatures were high. It also appeared from the surveys that poor soils were more favourable to the development of the disease than fertile soils. Replicated, randomized plots composed of very poor soil were therefore used to determine the effect of fertilizer in the form of ammonium sulphate, applied at various rates, on the development of wilt. The incidence of wilt was lowest in the plots receiving the largest quantity of fertilizer, only 29 per cent. wilt occurring on plots receiving 120 lb. ammonium sulphate per Chinese mow ($\frac{1}{6}$ acre) as against 62 per cent. on plots receiving 40 lb. Soil reaction tests were made in which bean plants were grown in infested soils varying from pH 5·02 to 8·87. Wilt occurred over the whole range, the highest percentage (57·2) occurring from pH 6·25 to 6·67.

Inoculation experiments showed that peas and common vetches may also be attacked. Isolations made from the rootlets, main roots, and hypocotyls of broad bean seedlings all yielded cultures of the pathogen although rootlet infection is the most important in the field. The fungus invades chiefly the xylem of the root and stem, frequently leaving granular, gum-like deposits, and spreads to the cambium and phloem tissues sparingly, invading the cortex only in the later stages of the disease. It remained viable for at least three years buried beneath the soil surface on diseased bean roots, and was shown to overwinter readily on old stubble and plant debris. Although there was no evidence of the fungus being present inside the seed, it was found on the seed coat, possibly through contamination at threshing time. Since the bean crop is rotated annually with rice and the fields ploughed and flooded between each crop, experiments were made to determine the longevity of the fungus in submerged soil. The organism was found to remain viable for at least 12 months so that water from infested rice fields may serve as an important means of spreading the disease.

Goidànich (G.) & Camici (Leontina). **Diffusione e dannosità della Macrophomina phaseolina (Tass) G. Goid. esistente quale polifago parassita in Italia.** [The prevalence and injuriousness of *Macrophomina phaseolina* (Tassi) G. Goid. existing as a polyphagous parasite in Italy.]—*Ann. Sper. agr.*, N.S., i, 3, pp. 485–520, 16 figs., 1947. [English summary.]

In this study on *Macrophomina phaseolina* [*M. phaseoli*: *R.A.M.*, xxvi, p. 435; xxvii, p. 387] the authors, after a critical review of the literature of the subject, describe the morphological and cultural characters of strains of the fungus isolated from beans [*Phaseolus vulgaris*] and lavender in three widely separated parts of Italy, and the symptoms as seen in the field.

The affected cortex and woody tissues contained numerous microsclerotia with attached dark, thick hyphae which became hyaline as they lengthened out and penetrated all the surrounding cells. Very occasionally, and only in the outer layers under the epidermis of the stem, pycnidia developed, mixed with the mass of microsclerotia; they were semi-erumpent, round, and markedly larger.

All the strains showed closely similar cultural and morphological characters. The sclerotia arise by cellular proliferation at any point in the hyphae after these have

darkened. At maturity they are typically spherical and smooth, though they may become gibbose as a result of the swelling of the peripheral cells. They appear hairy owing to the dark hyphae emerging from them. Though typically spherical, they may be oblong, discoid, or nearly pyriform; on rich media they become confluent, larger than normal, and very irregular in outline. Such bodies were not observed on the host. The hyphae of the microsclerotia are 7 to 8 μ wide. The sclerotia of the strain obtained from beans in Liguria were 65 to 75 μ on the host and 100 to 115 μ in cultures eight to ten days old; and from broad beans [*Vicia faba*] in Sardinia 115 to 135 μ in diameter in culture. All the strains would appear to fall into Haigh's C group [ibid., ix, p. 685]. Inoculation experiments on various hosts showed that the optimum temperature for the development of infection was about 31° C.

The paper concludes with a review of the distribution of the fungus in Italy, the damage caused by it, and possible control measures. Control is complicated by the fact that penetration can take place through undamaged tissues or through broken tissues in the roots and by the fact that the presence of microsclerotia in the soil constitute a continuous menace. Only indirect measures would appear to be possible at present, i.e., using disinfected seed or propagating material from localities where the disease is not yet present, preventing all forms of root injury, and using improved cultural methods.

Castellani (E.). **Su un marciume radicale della Scarola.** [On a root rot of Endive.]—*Agricoltura tosc.*, iii, 7, pp. 222–223, 1 fig., 1948.

In October, 1947, endives (*Cichorium endivia* [var.] *latifolium*) growing near Florence were observed to show a sickly condition. The heart leaves were small, closely packed together, and a dull, greyish green, while the outermost leaves were small, yellow, and withered. The yellowing and withering gradually spread from the outer to the inner leaves, but did not affect the heart. The affected plants remained stunted and were quite unsuitable for export. The roots were found to be in a very unhealthy condition. Many of the secondary roots had rotted and the tap-roots showed a brown discoloration of the internal cortex and the outside of the central cylinder, due to the presence of *Thielaviopsis basicola*, not, apparently, reported on *Cichorium* before. Experimental inoculations showed the fungus to be strongly pathogenic to endive. Further investigations are in progress; meantime, sterilization of the soil by heat or growing in sand with nutritive solutions is recommended.

Atkins (F. C.). **Disease caused by Dactylium spp.**—*Bull. Mushroom Gr. Ass.* 12, p. 119, 3 figs. (on p. 118), 1948.

Brief notes are given on the disease of cultivated mushrooms [*Psalliota* spp.] known as 'cobweb', 'mildew', or 'soft decay', and caused by species of *Dactylium* including *D. dendroides* [*R.A.M.*, xxvi, p. 437].

Soós (I.). **A szőlőn előforduló penészgombák hatása a szőlő és a must összetételére.** [The effect of moulds on the composition of Grapes and must.]—*Kisérl. Közl.*, xlvii–xlix, pp. 33–40, 1947. [English and Russian summaries.]

The influence of the moulds *Botrytis cinerea*, *Penicillium glaucum*, *Mucor* sp., and *Aspergillus niger* on media containing dextrose, fructose, tartaric, and malic acids was investigated at the Ampelological Institute, Budapest. *B. cinerea* and *P. glaucum* consumed large amounts of tartaric and afterwards of malic acid. On the other hand, if sugar was the sole source of carbon the acid content was increased through the formation of new acid out of sugar. *M.* sp. utilized tartaric acid to a slight extent in the presence of sugar only. *A. niger* caused a decrease in acidity only in sugar-free solutions. All four moulds produced acids from sugar. On a

medium containing 9·8 per cent. dextrose, for instance, *B. cinerea* produced 0·27 per cent. oxalic acid, *A. niger* 1·96 per cent. oxalic and 1·74 per cent. citric acid, and *P. glaucum* 1·47 per cent. citric acid. The same species and the *Mucor* evolved little formic acid in this sugar solution. Similar results were obtained, but less rapidly, in a medium containing 9·8 per cent. fructose. The addition to the substratum of 0·6 per cent. tartaric acid stimulated *A. niger* to the copious production of oxalic and citric acids, but again only scanty amounts of formic acid developed.

BAILLOT D'ESTIVAUX (L.). **Le cuprosulfite de cuivre anticryptogamique permanent pour la Vigne.** [Copper cuprosulphite, a permanent fungicide for Vines.]—*C. R. Acad. Agric. Fr.*, xxxiv, 1, pp. 37–40, 1948.

The author has evolved a new fungicide for use on vines, bivalent cuprosulphite of copper $[Cu\ (SO_3)]_2\ Cu\,.\,2H_2O$ or its hydrates. This material gives off soluble copper continuously, as well as reducing agents resembling those emitted by sulphur. Its main advantages are (1) it contains 49 per cent. metallic copper, (2) it is stable and insoluble in water, (3) it contains 41 per cent. SO_2 as stable sulphites, (4) it is simple to prepare and costs less than copper sulphate for the same copper content, and (5) its efficaciousness is such that it permits a great economy in the metal. Used as a fine dust, mixed with a small amount of inert material such as talc, it exercises a very strong action against *Oidium* [*Uncinula necator*] and mildew [*Plasmopara viticola*]. It can also be used as a colloidal suspension or a mixture.

Observations over a period of four years showed the presence of appreciable amounts of soluble copper on leaves treated several months before on which no visible trace of the application remained. On the other hand, 2 per cent. Bordeaux mixture, containing four times as much copper as cuprosulphite, after the same lapse of time left only insoluble copper on the leaves. Comparing the two treatments and making due allowance for the initial difference in copper content, cuprosulphite gives 165 times more soluble copper than Bordeaux mixture while leaving an ample reserve of copper on the leaf to become soluble later.

The fungicidal effects have not yet been fully tested, but in 1946, in one vineyard, the only rows unaffected by *P. viticola* on 16th September were those treated on 29th August with cuprosulphite. No burning resulted from the application.

SILBERSCHMIDT (K. M.). **Infectious chlorosis of Phenax sonneratii.**—*Phytopathology*, xxxviii, 5, pp. 395–398, 1948.

During a survey of species of Malvaceae for infectious chlorosis in 1946 and 1947, specimens of the weed *Phenax sonneratii* (Urticaceae), collected at São Vicente and Santos, São Paulo, were observed to bear symptoms of infectious chlorosis [*Abutilon* variegation virus: *R.A.M.*, xxvi, p. 546], the leaves of affected plants displaying pronounced vein-clearing and chlorotic spotting of the secondary veins. The disease was transmitted by grafting diseased scions on healthy stocks of *P. sonneratii* but not by sap inoculation.

The authors suggest that this virus disease, new to the Urticaceae, should be included in the group of infectious chloroses.

CONNERS (I. L.) & SAVILE (D. B. O.). **Twenty-seventh Annual Report of the Canadian Plant Disease Survey, 1947.**—xiii+118 pp., 1948. [Mimeographed.]

In the section of this report dealing with new or noteworthy diseases [cf. *R.A.M.*, xxvi, p. 7] it is stated that stem [black] rust (*Puccinia graminis*) [ibid., xxvi, p. 385] was unusually heavy on susceptible wheat varieties in Manitoba and eastern Saskatchewan, though the resistant varieties now commonly grown were unaffected or showed only a trace of infection. Durum wheat was lightly infected, barley more heavily than usual, and oats showed rather severe attack. In other parts of Canada black rust was of minor importance except for a few local epidemics.

Wheat leaf [brown] rust (*P. triticina*) [ibid., xxvi, pp. 8, 49] was severe except in Alberta and parts of Saskatchewan. The Regent, Redman, and Renown varieties, resistant when first developed, were almost as heavily rusted in central Canada as the susceptible varieties Thatcher, Apex, and Saunders.

T. Johnson and B. Peturson report on the incidence of physiologic races of cereal rusts in Canada in 1947. *Puccinia graminis tritici* race 56 was most prevalent, being isolated 98 times, followed by 38 (8), 15 (4), 29 and 32 (3 each), 17 (2), and races 10, 23, 39, 74, and 87 (1 each). *P. triticina* comprised 17 races, the most prevalent being 5a (34), 15a (33), 126a (28), and 58 (24), the decrease in prevalence of race 128a (128 in the 1946 summer) being a noteworthy feature.

Helminthosporium victoriae [ibid., xxvii, pp. 16, 313] was first recorded on oats in Canada at Ottawa in June, 1947. It was later found in every province except Alberta. The two new Canadian oats, Beacon and Garry, are susceptible, as are several American varieties which derive their resistance to *P. coronata* from their Victoria parent.

Examination of farmers' seed samples for smut [ibid., xxvi, p. 389] in western Canada showed that over 70 per cent. of the wheat, nearly 90 per cent. of the oats, and more than 95 per cent. of the barley samples for sowing in 1947 carried some smut. The introduction of the Cornell 595 wheat variety, which is resistant to loose smut [*Ustilago tritici*], should reduce losses from this disease in winter wheat in south-western Ontario, where Dawson's Golden Chaff showed an average infection of 11 per cent.

Lucerne bacterial wilt (*Corynebacterium insidiosum*) [ibid., xxvii, p. 121] has now spread to the Peace River District of Alberta and the Melfort section of Saskatchewan. It was also reported from British Columbia and Manitoba. Lucerne rust (*Uromyces medicaginis*) [ibid., xii, p. 177] is of minor importance in Canada, but its aecidial stage, not previously recorded in North America, was found on *Euphorbia cyparissias* near Arnprior, Ontario.

Flax suffered heavy losses from die-back and scorch caused by heat and drought in the dry central and western parts of Saskatchewan. Seedling blight due to *Rhizoctonia* [*Corticium*] *solani* and other fungi [ibid., xxiv, p. 4] caused exceptionally severe losses in Manitoba and a slight thinning of stands in Saskatchewan. Pasmo disease (*Septoria linicola*) [ibid., xxv, p. 61] was widespread and severe in Manitoba, while in south-eastern Saskatchewan it was more prevalent than in 1946, but caused little damage.

Bacterial ring rot (*Corynebacterium sepedonicum*) [ibid., xxvii, p. 537] was the third most important cause of the rejection of seed potato fields entered for certification, and was the main cause in Saskatchewan, Manitoba, Ontario, and Quebec. All potatoes were remarkably free from the disease in Prince Edward Island, Nova Scotia, and British Columbia [ibid., xxvii, p. 354].

Bean [*Phaseolus vulgaris*] rust (*Uromyces appendiculatus*) [ibid., xxvi, p. 187; xxvii, p. 56], usually of minor importance, was widespread in south-western Ontario, where it caused severe damage in some fields.

In a commercial field in York County, New Brunswick, 22 per cent. of the carrot plants showed the presence of a virus disease, referred to as 'dwarf'. The petioles or petiolules were frequently twisted and bent, with the lower surface of the leaf or leaflets uppermost. The lower and middle leaves displayed an irregular chlorotic mottling later superseded by a marginal chlorosis and finally by marginal reddening. Affected leaves died prematurely. The petioles were usually brittle and often showed necrotic streaking. The roots were small, with nodular growths. The condition resembled yellows (*Callistephus* virus 1) [aster yellows virus: ibid., xxv, p. 61], with which it was frequently associated. Plants attacked by both viruses together were severely stunted and distorted. Dwarf was transmitted to healthy carrots by an unidentified species of aphid found on infected carrots in the field.

Chives from British Columbia were affected by *Puccinia porri* [ibid., xvii, p. 703; xxiv, p. 388]. Onion smut (*Urocystis cepulae*) [ibid., xxvi, p. 404] was recorded, for the first time, in the Okanagan Valley, British Columbia. Onion yellow dwarf [ibid., xxvii, p. 57] appears to be well established in the Grand Forks and Vernon districts of British Columbia, 10 per cent. of the plants in seed crops and 1 per cent. of those in bulb crops being affected in the latter area.

The presence of pear stony pit in Ontario [ibid., xxvi, pp. 9, 399] was confirmed. Little cherry [ibid., xxvii, p. 28] is now present in all important fruit-growing parts of the Kootenays but it has not been observed in the Okanagan Valley, British Columbia. The disease is particularly amenable to detection by Linder's method [ibid., p. 354]. Blueberry stunt [ibid., xxvi, p. 113] and canker (*Godronia cassandrae*) [ibid., xxiv, p. 5] were recorded in western Nova Scotia for the first time.

Alnus mollis var. *crispa* near Percé, Quebec, showed leaf spot due to *Passalora bacilligera* [cf. ibid., iii, p. 102], the first record of this disease from Canada. Birch die-back [ibid., xxvii, p. 50] continued to cause heavy losses in the Gaspé Peninsula, Quebec, and the Maritime Provinces. Dutch elm disease (*Ceratostomella ulmi*) has spread westward in Quebec [ibid., xxvii, p. 256], north of the Ottawa River to within three miles of the Ontario boundary.

Haplobasidium pavoninum, previously recorded from California and Europe [ibid., xviii, pp. 401, 724], was observed on *Aquilegia*. *Chrysanthemum* stunt (the cause of which has not yet been ascertained but is possibly a virus), which apparently originated in a commercial greenhouse in New York, has become established in several greenhouses in Ontario and Nova Scotia. Leaf rot (*Heteropatella valtellinensis*) [ibid., xix, p. 349], previously recorded only from Europe, was found on carnations from New Westminster, British Columbia, and Seattle, Washington. *Peronospora gei* [ibid., xxv, p. 579] severely injured a seed crop of *Geum chiloense* at Keating, British Columbia. Peony blight (*Phytophthora paeoniae*) [*P. cactorum*: ibid., xxii, p. 170] was noted at Morin Heights, Quebec, though it may have been confused previously with *Botrytis* [*paeoniae*: loc. cit.]. Pansies in British Columbia were attacked by *Myrothecium roridum* [ibid., xxvii, pp. 10, 309], another new record for Canada.

BERTUS (L. S.). **Plant pathology.**—*Adm. Rep. Dir. Agric., Ceylon, 1946*, pp. D8–D11, 1948.

The following diseases were observed for the first time in Ceylon in 1946 [cf. *R.A.M.*, xxvi, p. 530]: blister blight (*Exobasidium vexans*) [ibid., xxvi, p. 358; xxvii, pp. 198, 199] of tea, leaf blight of carrots (*Macrosporium carotae*) [*Alternaria dauci*: ibid., xxvi, p. 405], ear head disease of *Pennisetum typhoides* (*Acrothecium pennisetii*, smut (*Ustilago crameri*) [ibid., xxiv, p. 187] on *Setaria italica*, *Sclerotium rolfsii* on sorghum, and *Fomes lucidus* [*Ganoderma lucidum*] on *Tamarindus indica*.

Numerous cacao trees on one estate in the Kandy district suffered from a relatively sudden incidence of die-back (apparently of a physiological nature), which in extreme cases had resulted in death. The condition appeared to be more serious on exposed slopes with a westerly outlook than in sheltered, shady hollows. A similar outbreak of die-back was reported from the same estate in 1933. In badly affected areas cacao trees should be planted in relatively dense shade.

An inspection of diseased *Casuarina* [*equisetifolia*] trees at Pallai revealed trees in all the coupes to be affected, but those of 1935 and 1939 suffered most. The casualties were heavier in the presence of undergrowth. Evidence indicated that the death of the trees, beginning with a die-back, was primarily due to the insufficient water-holding capacity of the soil, probably resulting in the death of numerous feeding roots during the dry period. *Trichosporium vesiculosum* [ibid., xx, p. 290], which was isolated from the majority of the older dead and dying trees,

appears to be only a secondary agent, which hastens the killing of the trees. It is also probable that during wet weather the soil is water-logged, and the alternate water starvation and water-logging are very favourable to the decline of *C. equisetifolia*. In order to help the soil to retain moisture, green or cattle manure should be added. All dead or dying trees should be eliminated.

Bud rot (*Phytophthora palmivora*) [loc. cit.] killed several coco-nut palms in the Negombo district. The unfolded leaflets yielded the causal fungus.

The die-back of mandarin, orange, and grape fruit trees at Nalanda, Wellassa, and Pelwebera fruit stations, occurring in only one or two branches of each tree, was caused by pink disease (*Corticium salmonicolor*) [ibid., xxvi, p. 531]. The fungus formed minute, pink pustules in small cracks in the bark. Around Bibile about 30 per cent. of the citrus trees were affected.

The plantain [banana] bunchy top eradication campaign [loc. cit.] has been continued and 276,512 diseased plants were uprooted and destroyed. The scheme was expanded to more districts. In the four Korales in the Kegalle district 181,964 diseased plants were destroyed, and in the three divisions of the Kandy district 17,418. After eradication of affected trees in January and July no further bunchy top infections were found up to December at the Giritale State farm, which serves as a nursery for supplying disease-free suckers.

Affected flowers of *Chrysanthemum cinerariaefolium* at Mahakudugala showed a discoloration of the receptacle. Isolations yielded a species of *Coniothyrium*. Inoculations of buds, flowers, and flower stalks, however, gave negative results.

The regulations relating to the control of banana bunchy top were published in the *Ceylon Government Gazette* No. 9,526, 1946, and the same number contains the regulations for preventing the introduction into Ceylon of a virus disease of sweet potato from Africa [ibid., xxvii, pp. 352, 353].

McDonald (J.). **Annual Report of the Department of Agriculture, Cyprus, for the year 1947.**—11 pp., 1948.

In Appendix IV (4 pp.) to this report [mimeographed and loosely inserted], L. J. S. Littlejohn, dealing with the plant disease situation in Cyprus in 1947 [cf. *R.A.M.*, xxvi, p. 25] states that lime-sulphur spraying against tomato mildew (*Oidiopsis taurica*) [ibid., xxvi, p. 174] was carried out in many districts. Broad beans suffered much damage from a disease of unknown origin, which occurs sporadically every year. The leaves turn yellow when the first flowers open; a general collapse of the green parts and the death of the plant follow. These symptoms result from a complete, sudden decay of the whole fine root and nodular system. No specific micro-organism appears to be involved, and no evidence has been found of mineral deficiency or genetic disorder, neither could the condition be transmitted experimentally from affected to healthy plants. Ornamental and fodder lupins when grown in Cyprus invariably succumb to a very similar trouble.

A series of wheat selections from crosses and from imported varieties was grown to test their reaction to *Puccinia graminis*. A moderate attack occurred, and selections with reasonable cropping capacity and a moderate degree of apparent resistance were chosen for further work.

De Ropp (R. S.). **Action of streptomycin on plant tumours.**—*Nature, Lond.*, clxii, 4116, pp. 459–460, 1 fig., 1948.

To investigate further the effect of streptomycin on plant tumours produced by *Phytomonas* [*Bacterium*] *tumefaciens* [*R.A.M.*, xxvii, p. 276] the author treated the upper surfaces of cylinders of sterile carrot tissue 10 mm. by 6 mm. high on sucrose mineral agar, with a suspension containing about 15×10^8 viable organisms for each cylinder. After one, two, six, and eight days, the carrot fragments were

transferred to sucrose mineral agar containing 50 γ per ml. streptomycin and their upper surfaces covered with 0·06 ml. of a 500 γ per ml. solution of streptomycin.

After three weeks' incubation in light at 25° C., it was found that where streptomycin had been applied one or two days after inoculation tumour formation was almost completely inhibited, and the tumours that did develop were very small. Six days after inoculation tumefaction had already begun, and application of streptomycin at this time slightly reduced the growth of tumours and changed their appearance, the untreated tumours being green and the treated ones white.

When bacteria-free sunflower tumour tissue was cultured on sucrose agar containing 50 γ per ml. streptomycin, growth was only 65 per cent. of that on streptomycin-free agar. The application of 50 γ per ml. of streptomycin completely inhibited root growth on sunflower stem fragments treated with indoleacetic acid, though it did not inhibit their initiation.

It is concluded that streptomycin is more probably a general inhibitor of the growth of embryonic plant tissue than a specific inhibitor of tumour tissue. Its inhibiting effect on tumour formation probably results from its action on the bacterial inciting agent.

ALIBERT (H.) & MEIFFREN (M.). **La maladie à virus des Cacaoyers, 'swollen shoot'.** [The virus disease of Cacao, swollen shoot].—*Rev. Mycologie, Suppl. colon.*, xii, 3, pp. 64–70, 1947. [Received March, 1948.]

Losses in cacao produced during 1947 due to the cacao swollen shoot virus [*R.A.M.*, xxvii, 515] were very great in the Gold Coast, whilst the damage in the Ivory Coast [ibid., xxvi, p. 97] was of less importance.

The results of transmission experiments carried out at Abengourou, Ivory Coast, showed that *Pseudococcus njalensis* and *P. citri* [loc. cit.] produced the first symptoms of the Kongodia form [ibid., xxv, p. 549] in 40 to 59 and 60 to 63 days, respectively, while *P. njalensis* produced the Sankadiokro form in 28 to 31 days. *Theobroma bicolor* and *Cola chlamidantha* act as reservoirs for the virus.

The control programme aims at destroying infected trees and the selecting of resistant clones.

ROSELLA (E.). **Les piétins des céréales au Maroc. Les organismes que l'on rencontre le plus fréquemment. Les conditions qui facilitent ou qui provoquent l'attaque.** [Cereal foot rots in Morocco. The organisms most often found. The conditions which favour or induce attack.]—*C. R. Acad. Agric. Fr.*, xxxiv, 10, pp. 681–683, 1948.

In Morocco, *Helminthosporium gramineum* [cf. *R.A.M.*, ix, p. 30; xvi, p. 244], while only exceptionally causing foot-rot of barley is able to cause damping-off. *Cercosporella herpotrichoides* [cf.ibid., xv, p. 207] plays a much less important part in cereal foot rot in Morocco than it does in France, but *Ophiobolus graminis* and *H. sativum* are common, the latter being apparently of primary importance and the more dangerous pathogen [ibid., ix, p. 29]. *Wojnowicia graminis* [ibid., xxvi, p. 388] is commonly found and a species of *Sclerotium*, associated with *O. graminis* and *H. sativum*. That *O. graminis* should be found frequently in Morocco is not surprising. In France it is most harmful in the south-west. Its pathogenicity appears to be favoured by alternate wet and dry periods, the latter, seemingly, predisposing the plants to infection. *H. sativum* was isolated on numerous occasions from plants with whiteheads and from atrophied plants, in which it had invaded the roots and the base of the collar; isolated from such plants the fungus was able to infect cereals, particularly barley varieties, on which it produced generalized infection in under 48 hours. On fully developed plants the author observed only leaf-burn, but his observations indicated that *H. sativum* can cause damping-off of barley seedlings and impede or arrest, to some extent, the development of cereals

before harvest. It is carried over from one year to the next on 'ropy' or spotted wheat and barley seed. Seed treatment with quinoline sulphate has given good results against *C. herpotrichoides*.

Both in France and Morocco damping-off, followed by whiteheads and lodging, due to *C. herpotrichoides* are most severe in cereals sown too thickly and too deeply. Sowings made too deep may be responsible for some cases of damping-off, but nutrition appears to determine the seriousness of foot rot and whiteheads. The organisms responsible (*O. graminis* and *H. sativum*) are often found on plants which appear to be threatened by non-parasitic whiteheads. Penetration of the root systems and the sheaths of barley and wheat by foot-rotting organisms and weak pathogens appears to be facilitated by inadequate nutrition and, even more, by periods of drought. In Morocco, foot-rot patches are often found in places where cereals make poor growth, and where the soil is poor and shallow. Affected plants often present a very similar appearance whether fungal infection is heavy, moderate, or none. In many cases, the fungi appear to have been only of transitory importance. Whiteheads is the symptom most commonly found. Control depends on improved cultural conditions and, in many cases, on the use of fertilizers

Brentzel (W. E.). **Studies on ergot of grains and grasses.**—*Bull. N. Dak. agric. Exp. Sta.* 348, 20 pp., 5 fig., 1947.

The main object of this research was to find a means of controlling ergot of grains and grasses (*Claviceps purpurea*) [*R.A.M.*, xxiv, p. 230; xxvi, p. 493; xxvii, p. 314] in North Dakota either by cultural methods or by chemical seed treatment. Considerable preliminary work led to the development of a technique by means of which ergot was produced in the greenhouse under controlled environment.

Samples of ergot from durum wheat, barley, rye, and *Agropyron repens* [ibid., xxvi, p. 52] in pots of sandy soil covered with pure white sand were watered, alternately frozen and thawed for 24 hours at approximately two-weekly intervals from December to the end of February, after which they were kept at 0° to 5° F. until 1st June, and finally at 60° F. Three weeks later the sclerotia began to bear stromata prolifically. It was concluded that a rather cool temperature and high atmospheric humidity were necessary for germination. Further samples similarly treated germinated continuously from August to October. Water-logging did not check germination nor did a depth of soil up to 1 in., but temperatures over 50° during the thawing period were unsatisfactory. The longevity of sclerotia appears to be at least 38 months.

The usual seed treatments were unsuccessful in destroying ergots, but complete inhibition of 200 barley ergot sclerotia was obtained following treatment with formaldehyde or ceresan; 22 per cent. of the non-treated sclerotia germinated.

Honeydew droplets developed on plants in the greenhouse 7 to 10 days after being sprayed while in bloom with a suspension of *Sphacelia* spores. Such spores from barley infected a number of hosts, including barley, rye, *A. repens*, *A. smithii*, *A. cristatum*, and *Bromus inermis*. Similar inoculations produced honeydew infection on *B. inermis* and *A. repens* in the field in 10 days. Honeydew from barley sprayed on to barley and oat flowers infected five barley heads out of 15 but not oats; *Sphacelia* spores from *Poa* sp. infected *Elymus virginicus* and *E. canadensis* but not oats, which appear to be mainly resistant in North Dakota. *Sphacelia* spores from barley and *B. inermis* remained viable for 9 and 22 months respectively when stored in vitro at 44°. Stromata were still viable after being stored for 42 days. An ergot epidemic was induced at flowering by spraying experimental rye plots with a suspension from cultures grown in bottles on cooked grain to produce large numbers of spores. Seven days later honeydew was observed followed by ergot development. Data obtained from 200 heads taken from each plot showed that the single

inoculation produced an average of 0·66 sclerotia per head compared with 0·34 in non-sprayed plots which were probably due to natural infection. The average weight of seeds from ergotized and non-ergotized heads was 17 and 18 mg., respectively.

Methods of controlling ergot by sanitation include removing sclerotia from the seed and ensuring that none is left in the soil from the previous crop. Grasses along roadsides on waste land or hay land should be mowed soon after blooming, before ergot develops, and the soil kept in a clean condition by cultivation and rotation. Ergot may be removed from small seed lots by adding 20 per cent. common salt to water (40 lb. to 25 gals.) so that the ergots rise to the surface. The seed should be washed before sowing to remove the salt.

Butler (F. C.). **Take-all of Wheat.**—*Agric. Gaz. N.S.W.*, lix, 5, pp. 248–250, 3 figs., 1948.

Take-all (*Ophiobolus graminis*) [*R.A.M.*, xxvii, pp. 180, 221, and next abstract], causes yield reductions up to 50 per cent. in individual crops in Australia. It occurs on a number of native grasses including *Bromus sterilis*, *Vulpia bromoides*, *V. myuros*, *Agrostis* spp., *Phalaris canariensis*, and *Hordeum leporinum*. Control measures include, in addition to those already noticed [loc. cit.], early and bare fallowing, late fallowing and fallow under grasses being worse than none. Ploughing through diseased patches, when the soil is very dry, should be avoided, as it assists the spread of the fungus. Cereal varieties should be sown at the correct time, according to their seasonal characteristics. Feeding-off should be avoided and burning-off is not recommended unless take-all infection is extensive.

[Scott (R. C.).] **'Take-all' and 'hay-die' in cereal crops.**—*J. Dep. Agric. S. Aust.*, li, 11, p. 531, 1948.

It is stated that both hay-die and take-all of cereals are caused by the same fungus [*Ophiobolus graminis*: *R.A.M.*, xxvii, p. 418 and preceding abstract]. Where the crop is destroyed in the early stages the disease is known as 'take-all', but where it is less serious and plants are not attacked until fully grown it is known as 'hay-die'. The disease organism multiplies most rapidly with a combination of a host plant and moist autumn, and remains viable in the soil for two years without a host plant. The fungus was found, in experiments in South Australia, to kill 83, 49, 21, and 3 per cent. of affected wheat, barley, rye, and oats, respectively.

Scott (R. C.). **New Wheat varieties and disease resistance.**—*J. Dep. Agric. S. Aust.*, li, 11, pp. 527–531, 1948.

Owing to the occurrence of wheat red [brown] rust [*Puccinia triticina*: *R.A.M.*, xxvii, pp. 69, 221] in southern Australia during the past two years, plant-breeders throughout the Commonwealth are paying particular attention to the development of rust-resistant varieties. The varieties developed in recent years and adapted to South Australian conditions include Warigo, a high-yielding, highly rust-resistant variety from a cross between Hope and Nabawa from which it inherits resistance to flag smut [*Urocystis tritici*] and loose smut [*Ustilago tritici*]; Glen Wari (N. R. H.) from a cross between Nabawa, Riverina, and Hope, which promises to be very useful in the medium rainfall districts of the State, and the rust-resistant Frisco from Kenya × Florence × Dundee × Gular, which shows promise in New South Wales. Other promising varieties include Koorda, from a cross between Nizam and Nabawa with resistance to flag smut, and Scimitar which is fairly resistant to brown rust and yields well in normal seasons. It is built up from a Nabawa × Egyptian 4 cross.

Prasada (R.). **Darluca filum (Biv.) Cast., a hyper-parasite of Puccinia graminis and Puccinia triticina in the greenhouse.**—*Curr. Sci.*, xvii, 7, pp. 215–216, 1948.

During greenhouse investigations of wheat rusts at Simla, India, the author observed the parasitism of uredinia of *Puccinia graminis* and *P. triticina* by *Darluca filum* [*R.A.M.*, xxvi, p. 265] each year in July, August, and September. The hyper-parasite disappeared after the rainy season or when the plants were removed to a dry place. The results of inoculation experiments also indicated that *D. filum* can develop only under very humid conditions, and the author therefore considers that it would be useless for the control of cereal rusts in nature.

Grasso (V.). **Le specie di Tilletia del Frumento esistenti in Italia e loro distribuzione geografica.** [The species of *Tilletia* present on Wheat in Italy and their geographical distribution.]—Reprinted from *Ann. Sper. agr.*, N.S., ii, 23 pp., 6 figs., 1 graph, 2 maps, 1948.

This is an expanded account of work already noticed from another source [*R.A.M.*, xxvii, p. 415].

Informaciones de interés para los trabajos de selección de plantas resistentes a la carie. [Notes of interest for the work of selection of bunt-resistant plants.]—*Hoja inform. Minist. Agric., B. Aires*, 8, 3 pp., 1948. [Mimeographed.]

Wheat, rye, and other cereals sustain heavy damage from bunt (*Tilletia caries* and *T. foetida*) in Argentina [*R.A.M.*, xxiv, p. 207], especially in the south of Buenos Aires, La Pampa, and part of Córdoba. The divergent reactions of certain varieties to different populations of the pathogens demonstrates the existence of physiologic races, but nothing is known of their distribution in the country. Inoculation experiments have shown that, in general, wheat varieties of the *Triticum vulgare* group are more susceptible than those of *T. durum*, among the resistant in the former category being Oro, Hope, Regent, Hope × Lin Calel, Cheg 89 × 5152, Klein Pirámide, and Klein Orgullo, and in the latter Mindum, Monad, South African, Taganrock, Hedba, Candeal, and Fideos Klein. Khapli (*T. dicoccum*) is also resistant. A list shows the reactions of 18 other varieties to the disease.

Roane (C. W.). **Varietal reaction of Oats to powdery mildew in Virginia.**—*Plant Dis. Reptr*, xxxii, 9, p. 391, 1948. [Mimeographed.]

In 1948, several spring oat varieties at the Shenandoah Valley Field Station, and winter oats at Blacksburg, Virginia, were attacked by powdery mildew (*Erysiphe graminis*) [*R.A.M.*, xxvi, p. 296]. The most resistant spring varieties were Vicland (8 per cent. infection), Orange 11–730 (14), Orange 33–717 (15), Benton (15), and Andrew (16). Of the winter varieties, Columbia TBH, Lee Cold Proof, Lee-Victoria × Fulwin Cl 4599, Letoria, Pioneer, Traveler, Victorgrain, and VPI # 1 were free from infection.

Dennis (R. W. G.) & Sandwith (N. Y.). **Aecidia of Barley rust in Britain.**—*Nature, Lond.*, clxii, 4116, p. 461, 1948.

On 14th March, 1948, the second author collected rust spermogonia on a leaf of *Ornithogalum pyrenaicum* near Ham Spray, Wiltshire, and on 2nd April two aecidia were found. On 15th April, 27 of 32 infected leaves examined bore spermogonia associated with teleutosori of *Puccinia liliacearum*, but five had spermogonia and aecidia without associated teleutospores. Inoculations from these latter aecidia were made to barley seedlings and on 23rd April uredo pustules of *P. hordei* [*R.A.M.*, xxvi, p. 99] appeared on the inoculated leaves, becoming erumpent a day later. The only patch of *O. pyrenaicum* in the original locality at Ham Spray bearing *P. hordei* was adjacent to a field which carried barley in 1947. It is con-

sidered that the aecidia may be important both in the overwintering of barley rust where *O. pyrenaicum* is locally abundant as it is in parts of south and west England, and also in affording opportunities for hybridization between existing physiological races of the fungus.

WATERHOUSE (W. L.). **Studies in the inheritance of resistance to rust of Barley. Part II.**—*J. roy. Soc. N.S.W.*, lxxxi, pp. 198–205, 1948.

Further studies [cf. *R.A.M.*, vii, p. 314] on the resistance of barley to leaf rust (*Puccinia anomala*) [*P. hordei*: ibid., xxvii, p. 316] and stem [black] rust (*P. graminis*) and to a small extent to powdery mildew (*Erysiphe graminis*) [ibid., xxvi, p. 296] were made at the University of Sydney in which numerous F_1 tests and a few F_2 and F_3 back-crosses from parents obtained from widely scattered sources confirmed the action of a single dominant factor for resistance to *P. hordei*. This result is entirely different from that obtained in unpublished studies on wheat leaf rust [*P. triticina*] where at least two major genes are involved. Many F_1 tests showed the dominance of resistance to *P. graminis tritici* race 43 and of susceptibility to races 34 and 45. No correlation between resistance to *P. hordei* and to *P. graminis* was found, or to certain morphological characters that were examined. Greenhouse and field tests demonstrated the resistance to *E. graminis* of C.I. 2269, C.I. 2215, C.I. 2237, C.I. 2280, C.I. 2218, C.I. 2250, Lion, No. 22, Psaknon, White Hull-less, Bolivia, C.I. 2329, Juliaca, Coast, Portuguese, Goldfoil, Hanna, Bark, Bel. 2071, Duplex, 017, Kwan, and Weider.

RAMAKRISHNAN (T. S.). **Ergot sclerotia on Sorghum vulgare Pers.**—*Curr. Sci.*, xvii, 7, p. 218, 1 fig., 1948.

Maturing sorghum crops in South India are attacked annually by the sugary disease (*Sphacelia sorghi*) [*Claviceps* sp.: *R.A.M.*, xxi, p. 206; xxiii, p. 165; xxv, p. 36] in December and January, but in the Coimbatore district only the sphacelial stage has been recorded so far.

In November, 1946, a heavy outbreak of the disease occurred in the Kurnool District, Madras Province. The ears of infected specimens exhibited profuse sclerotial formation, almost every other spikelet bearing one creamy to grey, cylindrical, elongated, or slightly curved sclerotium.

Spraying of sorghum flowers before and at the time of opening with conidial suspensions from cultures resulted in successful infection, the highest incidence occurring when inoculation took place at the time of flower opening. At Coimbatore, however, only the 'honeydew' stage developed, probably owing to high temperature; it is probable that a cooler climate is necessary for the formation of sclerotia, as its occurrence has been observed only at higher altitudes. Ergotoxine [ibid., xi, p. 446] was absent from the sclerotia.

KLOTZ (L. J.) & STEWART (W. S.). **Observations on the effect of 2,4-D on fruit-stem die-back in Citrus.**—*Calif. Citrogr.*, xxiii, 10, p. 425, 1 fig., 1 diag., 1948.

Fruit-stem die-back occurs throughout California citrus orchards, particularly on oranges and grapefruit, and is characterized by a dying of the fruit stem starting near the fruit-button and extending a few inches to as much as 3 ft. up the stem, often accentuated late in the harvest season when the trees are carrying two fruit crops, namely, mature fruit of the current crop and young fruit of next year's crop. Although the causes have not yet been clearly defined the condition is presumed to be due to adverse climatic and soil factors acting to modify the physiology of the tree. Gumming of the water-conducting vessels or the maturation of the abscission between the fruit-stem button and the fruit interferes with the supply of water entering and leaving the fruit reservoirs and may contribute towards die-back initiation. *Diplodia* and *Phomopsis* spp. have been found capable of causing

bark and wood lesions when inoculated into wounds and rapidly to involve bark that has been injured by frost, oil, or other chemical. These fungi probably play an important secondary role in killing the fruit stems after the initial injury has taken place. During 1947 important reduction of die-back was observed with all three types of citrus fruit where 2,4-D (2,4-dichlorophenoxyacetic acid [*R.A.M.*, xxvi, p. 460]) was applied one to three months prior to observation. The reduction in die-back in three plots of Valencia oranges sprayed on 26th May, two with 8 and one with 16 p.p.m. 2,4-D in water and observed on 7th August, 1947, was 83·3, 80, and 81·9 per cent., respectively, and for a plot of grapefruit sprayed on 6th June, with 8 p.p.m. 2,4-D in water and observed on 21st July, 1947, 91·6 per cent. The percentage reduction observed on 7th August, 1947, in plots of Valencia oranges sprayed on 15th October, 1946, with 5 and 25 p.p.m. 2,4-D in water was 49 and 18, respectively, and 90·8 observed on 20th May, 1947, in plots of Thomson Navel oranges sprayed on 28th February, 1947, with oil spray plus 10 p.p.m. 2,4-D. It is assumed that 2,4-D reduces fruit drop and consequently stem die-back as well, by delaying the maturation of the abscission or separation layer which holds the fruit to the stem. It is quite possible that a water stress may initiate the changes in the fruit stem which, without 2,4-D, would otherwise lead to maturation of the abscission layer.

Klotz (L. J.). **Citrus twig dieback.**—*Calif. Citrogr.*, xxxiii, 9, p. 381, 1 fig., 1948.

Twig die-back, which develops during the spring on Navel, Valencia, and grapefruit trees, was general throughout the citrus-growing areas of California in 1946, being particularly severe in Tulare County Navel orchards.

Twigs and small branches are killed back from a few inches to 2 ft. or more and side shoots of the current spring's growth may wilt and die. The infection may enter the main twig which is girdled, killing everything beyond to the end. Isolations from injured twigs yielded *Alternaria*, *Colletotrichum*, *Fusarium*, *Hormodendron*, and *Stemphylium* spp. besides several bacteria. The parts of the tree facing the south and south-west suffer the most injury, and groves in poor condition from lack of care, waterlogging, and cold showed more die-back than well-kept groves. The stimulus to growth and transpiration caused by unusually early warm spring weather probably plays a part in the injury since the foliage cannot be supplied with sufficient moisture by the relatively inactive roots in the cold soil. The stress also may induce gum formation which plugs the water-conducting vessels. The destruction of the injured twigs is probably completed by the fungi and bacteria present.

Kiely (T.). **Guignardia citricarpa n.sp. and its relationship to the black spot disease of Citrus in coastal orchards of New South Wales.**—*J. Aust. Inst. agric. Sci.*, xiv, 2, pp. 81–83, 1 fig., 1948.

It was formerly thought that the chief source of latent black spot infections on young Valencia [orange] fruits in New South Wales was supplied by the pycnidiospores of *Phoma citricarpa* [*R.A.M.*, xxvii, p. 469], which had developed in lesions on mature fruits. Pycnidia, spermogonia, pycnidiosclerotia, and an undescribed ascigerous stage developing within the last-named structure, were later found over the entire surfaces of dead citrus leaves of all kinds in most central coast orchards. The relationship between these structures was established, and the sexual stage is named *Guignardia citricarpa* n.sp. The fungus was also found locally in a latent form within the leaves of native shrubs in the bush and cultivated plants of nine different families.

The development of *G. citricarpa* on the surface of sterilized dying citrus leaves was found to originate from latent infections in the living green leaves and not as a saprophytic growth from spores lodging on the dead leaves. The production of

these fructifications on dead citrus leaves was all the more remarkable in that lesions on living orange leaves are very rare in the central coastal area though they are occasionally seen on lemon.

Wilting of picked green leaves in the sun for six to twelve hours greatly increased the likelihood of the development of the fungus on the leaves, and the alternate wetting and drying daily after wilting also influenced it favourably. As a rule, six days after the leaves had been removed from the tree, a profuse development of spermogonia and pycnidiosclerotia appeared. At this stage an incubation range of 25° to 30° C. was desirable. Young leaves of only a few months' maturity required much longer exposure to the sun after picking to achieve the development of the various fructifications.

Latent infections survived 18 days in wilted, air-dried citrus leaves, and produced fructifications when the leaves were subsequently wetted. This indicates that even in very hot, arid conditions without dews for several nights, latent infections probably survive, and when the alternate wetting and drying provided by dews and fine days ensues ascospore maturation and the production of ascospore inoculum is assured.

Ascocarps generally mature three to four months after leaf fall, and air-borne ascospores provide the chief source of infection, mature perithecia being found in dead citrus leaves throughout the year. Heavy dews suffice to induce ascospore discharge from mature perithecia, though at this stage rain is probably more important in securing a heavier discharge.

Deposits of Bordeaux mixture on citrus foliage in no way impede the production of the various fructifications. Its continual use in many commercial orchards for periods up to ten years at concentrations giving satisfactory control on the fruit has failed to reduce ascospore inoculum and to prevent latent infections from becoming established in the leaves. Applications made in September to protect the foliage similarly failed.

While older citrus trees provide a more constant source of inoculum from the dead leaves, latent infections have been found in apparently healthy green leaves of citrus yearling trees in coastal nurseries, and the fungus has been developed on the dead leaves from these trees. Such trees supply a continual source of potential inoculum year after year to be introduced into the inland irrigation settlements which, so far, have remained apparently unaffected. That the disease has sometimes become established in this way has been demonstrated.

An interesting feature of the disease is the manner in which infections can become established in young fruit and leaves and yet remain latent for months. On young trees the mature fruit lesions never develop. When these trees reach their eighth to tenth year in central coast areas the disease appears in its recognizable form on the mature fruit. However, the mature fruits of Valencia trees up to 25 years old in these districts are apparently unaffected, though latent infections have been found in the rind. Although an area may appear unaffected the demonstration of latent infections within the green citrus leaves and the identification of the ascigerous state on the dead leaves would prove the presence of the causal organism.

Wager (V. A.). **The black spot disease of Citrus.**—*Fmg S. Afr.*, xxiii, 267, pp. 386–390, 3 figs., 1948.

During the past year citrus black spot (*Phoma citricarpa*) [see preceding abstract] has spread to many more orchards in eastern and northern Transvaal.

The spores of the fungus enter the fruits when they are still small but no spots develop until they begin to mature and the weather becomes warmer. The effect of temperature was demonstrated by dividing apparently healthy fruit taken from the shady side of an infected tree, into two lots, one lot being held at 60° F. and the other incubated at 80°. Spots developed on this lot after four days and after

two weeks all the fruits were severely spotted, while no spots had developed on the cooler lot after three weeks. Similar results were obtained with green fruit and slightly coloured larger fruit.

Badly spotted fruits divided into three lots and incubated at 40°, 70°, and 85° developed an average of 2, 11, and 21 new spots per fruit, respectively, at the end of one week, and an average of 2, 5, and 4 more, respectively, at the end of the second week, indicating that if infected fruit is placed in cold storage, little further infection develops, but unless such facilities are available, it is inadvisable to attempt to export fruit from an infected orchard.

Smooth lemons are most susceptible to infection and are affected at any stage from the time the fruits are 2 in. in diameter. Rough lemons, grapefruit, mandarins, and Valencias are also affected. In the cooler areas such as the Natal mist belt the disease appears after the fruit is internally mature and has passed the government tests.

Suggested control measures include picking from infected orchards as early as possible, and from the sunny side of the tree first, inducing early ripening in infected orchards by spraying with lead arsenate (1 lb. per 100 gals. water) every third year except in areas such as Verulam and Barberton where the disease occurs early, and avoiding the propagation of young trees from nurseries in an infected area.

Spraying with Bordeaux 2-1-80 and 50 per cent. copper oxychloride (1 lb. in 80 gals.) at $\frac{2}{3}$ petal drop, with two further applications at intervals of six weeks is advised at present [cf. *R.A.M.*, xix, pp. 69, 143]. The addition of oil at 1 gal. in 40 gals. water to the third spray controls scale where necessary [loc. cit.].

Meneghini (M.). **Experiências de transmissão da doença 'tristeza' dos Citrus pelo pulgão preto da Laranjeira.** [Experiments in the transmission of the 'tristeza' disease of Citrus by the Orange black aphid.]—*Biológico*, xiv, 5, pp. 115–118, 1948. [English summary.]

In experiments on the transmission of 'tristeza' root rot in São Paulo, Brazil no perceptible decrease in the infectivity of *Aphis tavaresi* followed 24 hours starvation before the transference of the aphids from diseased to healthy orange plants [*R.A.M.*, xxvii, p. 130], but after 48 hours the virulence of the vectors was almost completely lost. Nine out of ten sweet oranges of the Pear variety grafted on sour stocks 45 days after infestation by *A. tavaresi* developed root rot. When the sweet oranges were grafted on sour stocks infested 45 days earlier the results were positive in two out of ten tests.

The starch reaction test in the grafting zone was negative in seven plants (one sweet and six sour) of healthy appearance, and in eight out of 13 (six sweet, two sour, and five combinations) of sickly aspect.

Evodia hupehensis proved to be a suitable host for the breeding of *A. tavaresi*. Applied at the rate of over 200 per plant, non-viruliferous aphids bred on this host failed to infect sweet oranges grafted on sour stocks, but after previous feeding on diseased plants they induced root rot symptoms on eight out of ten. *A. tavaresi* did not exert any noticeable toxicogenic action on the experimental plants.

Moreau (C.). **Deux maladies du Citrus bigaradia Risso au Cameroun.** [Two diseases of *Citrus bigaradia* Risso in the Cameroons.]—*Rev. Mycologie, Suppl. colon.*, xii, 3, pp. 84–86, 2 figs., 1947. [Received March, 1948.]

Among the interesting fungi collected by M. H. Jacques-Félix at Yokadouma in the Cameroons in 1939 were *Sphaeropsis tumefaciens* [*Phytopathology*, i, pp. 63–65, 1 pl., 1911] and *Ascochyta citricola* on the branches of Seville orange trees. *S. tumefaciens* which is common in Jamaica, Cuba, southern Florida, Peru, the Hawaiian Islands, and also occurs in Egypt and probably British Guiana, affects citron trees and occasionally orange trees causing growths known as knots. It

curious, however, that no such knots occurred on the Cameroons specimens, only numerous subglobose, ostiolate pycnidia isolated or grouped and measuring 120 to 230 μ in diameter, bearing all the characters of the fungus observed by Hedges and Tenny. The ovoid, yellowish spores, more or less pointed at the extremity and borne on short, fine sporophores measure 17 to 28 by 7 to 11 μ. The sole method of control consists of burning infected branches.

A. citricola, of far less importance than *S. tumefaciens*, appears on the branches as scattered, globose or subglobose, dark brown pycnidia, 90 to 150 μ in diameter, with an ostiole measuring 15 to 20 μ. The numerous ellipsoid, uniseptate, hyaline or slightly yellow spores, borne on a sporophore, measure 9 to 11 by 3·5 to 5 μ. This disease is known in South Australia, where it was found and described by McAlpine. [Fungus diseases of Citrus trees in Australia, and their treatment. Melbourne, 1899.]

WALLACE (MAUD M.). **Ascochyta blight of Cotton.**—*E. Afr. agric. J.*, xiv, 1, pp. 10–11, 3 figs., 1948.

Early in February, 1947, cotton plants in an area of 35 sq. yds. at Lubaga, Lake Province, Tanganyika, were nearly all killed by *Ascochyta* blight (*Ascochyta gossypii*) [*R.A.M.*, xx, p. 14; xxii, p. 153]. In April, 1948, the same disease was reported in spite of an abnormally dry season, from a small area at Ukiriguru in the same Province. It now seems clear from a re-examination of the specimens and records that the *Ascochyta* reported from Tanganyika in 1928 [ibid., ix, p. 506] was *A. gossypii*. Apparently the fungus is often present but in an innocuous form. The control measures include a close watch for the parasite throughout the growing season, especially during and after wet weather, and the destruction of all infected plants. All ground should be carefully cleared of dead cotton trash which should be burned. Crop rotation is also suggested as a possible means of eliminating the disease.

Les champignons 'Ambrosia' en relation avec les Scolytides et Hyménoptères foreurs. ['Ambrosia' fungi in relation to Scolytids and tunnelling Hymenoptera.]—*Bull. Soc. for. Belg.*, lv, 3, pp. 135–136, 1948.

In a paper published in the Czech journal *Lesnická Práce* (No. 12, 1947) Dr. O. SLABY of Prague University gives a full account of the different hypotheses on which the classification of ambrosia has been based [*R.A.M.*, xv, p. 827; xviii, p. 448; xxv, p. 448]. In Czechoslovakia, the ambrosia fungus has been found only on a few phenotypes, though in tropical regions it occurs mostly on cultivated plants [ibid., xxvii, p. 70]. The view that moulds of the genus *Ceratostomella* are constantly associated with ambrosia has recently become more widespread. Similar moulds have been found in the larvae of *Ips typographus* [cf. ibid., xviii, p. 488] but it seems that these fungi are not of the ambrosia type. The author states that many fungi resembling ambrosia have been found associated with Siricidae and Xiphydrinae. Peklo recently stated that he had found *Azotobacter* associated endosymbiotically with *I. typographus*.

CASS SMITH (W. P.) & HARVEY (H. L.). **Zinc deficiency of flax.**—*J. Dep. Agric. W. Aust.*, Ser. 2, xxv, 2, pp. 136–142, 6 figs., 1948.

Zinc deficiency of flax [*R.A.M.*, xxv, p. 342; cf. xxvii, p. 322] was first reported from Western Australia in 1943 and became serious in 1945. In the most severe cases a few top leaves and the growing point were killed when the seedlings were one to two inches high; one or two lateral shoots were frequently produced lower down. The bronzing and death of the leaves and stem below the tip is preceded by rosetting. The tip of the seedling bends as a result of stem necrosis. Bronze to black leaf-spotting, which often occurs on badly affected plants, was observed in large patches that showed none of the severe symptoms.

Observations indicate that excessive soil moisture is the most important factor associated with zinc deficiency, the severity of symptoms being in direct proportion to the amount of waterlogging. Length of day also appears to be involved, as side growth or regrowth of not too badly damaged tips takes place during the lengthening days in August, even when the soil is waterlogged. The most severe die-back occurs on grey to grey-brown, gritty or gravelly loamy sands to sandy loams with clay at a depth of one to two feet. Superphosphate dressings further the incidence of die-back.

The addition of zinc sulphate to fertilizer at planting time yielded healthy plants which had a much higher zinc content than plants which had received none.

Buchwald (N. F.). **Lidt om Brogetbladetheden hos Abutilon-Arter. Arvelig og virøs Panachering.** [A note on leaf-breaking in *Abutilon* species. Hereditary and virus variegation.]—*Gartnertidende,* lxiv, pp. 313–317, 8 figs., 1948.

The history of infectious variegation in *Abutilon* spp. [*Abutilon* variegation virus: see above, p. 553] and some outstanding contributions to the literature on the subject are briefly summarized, and a supplementary note is given on the hereditary forms of the anomaly.

McWhorter (F. P.) & Price (W. C.). **Enation disease of Primula.**—*Plant Dis. Reptr,* xxxii, 8, p. 345, 1948. [Mimeographed.]

During 1947–8, several *Primula malacoides* plants (Pure White Improved) grown in pots in fresh potting soil in the Phipps Conservatory at Pittsburgh developed crenate veins, which gave rise to leaf-like enations on the upper surfaces of the leaves of five plants, during the early stage of flowering. Later, outgrowths developed from the bases of the original enations, from which secondary enations arose, forming clusters of five to eight leaflets, and extending as much as 20 mm. above the parent leaf. Sometimes the original enation became filiform reaching up to 25 mm. in length. It appears that the disease was introduced in the seed.

Magie (R. O.). **Stemphylium leaf spot of Gladiolus in Florida.**—*Plant Dis. Reptr,* xxxii, 8, pp. 344–345, 1948. [Mimeographed.]

Gladiolus growers in Florida suffer annual losses due to a leaf spot, caused by a species of *Stemphylium*. The diseased leaf and stem tissues bear round, pale yellow, translucent spots, measuring 1 to 3 mm. in diameter, with a characteristic reddish-brown centre. In most cases the leaves are killed after the flower spikes are cut, resulting in less vigorous and smaller corms, but sometimes the leaves are killed before flowering, causing a total loss.

Infection is rapid; it takes place during wet periods, killing the leaves of the most susceptible varieties after two weeks. The disease usually spreads radially from the highly susceptible varieties (Stoplight, Casablanca) to the less susceptible ones (Picardy) decreasing with the distance from the focus of infection. It does not occur during summer and autumn, but reappears in the winter, temperatures between 55° and 84° F. being most conducive to epidemics.

Fungicides have not given complete control, but spraying with zinc ethylene bisdithiocarbamate materials protected the foliage until harvest time. Phygon ($\frac{1}{2}$–100), dithane, and parzate were also effective, but reduced the size of the corms. It is suggested that the more susceptible varieties should not be planted close to those which are less susceptible and that successive plantings of the latter should be separated by resistant varieties.

Baker (K. F.). **Developments in California floriculture.**—*Flor. Exch.,* cx, 8, pp. 14, 52, 1948.

In this review of the present situation in the cut-flower industry in California the author states that soil-borne diseases have been responsible for the transient

nature of the cultivation of certain crops in some localities. For example, the possibility of *Fusarium* wilt [*F. conglutinans* var. *callistephi*: cf. *R.A.M.*, xvi, p. 812; xxiii, p. 489 et passim] checks the raising of China asters in soil previously planted with this crop. In low pockets in the hilly areas where asters are now grown the plants may remain wet for many hours after irrigation, and a new foliage disease of this host caused by a species of *Stemphylium* has appeared. Similarly, *Gladiolus* plantings have continually been moved because of *Fusarium* yellows [*F. oxysporum* var. *gladioli*: ibid., xxv, p. 303; xxvii, p. 73], bacterial scab [*Bacterium marginatum*: ibid., xxvi, pp. 59, 453], and dry rot [*Sclerotinia gladioli*: ibid., xxiv, p. 103]. *Botrytis* disease of *Gladiolus* [*B.* ? *cinerea*: cf. ibid., xx, p. 468] has become a limiting factor in *Gladiolus* production.

In 1947, stock [*Matthiola incana*] plantings were badly damaged by mosaic [cf. ibid., xxv, p. 67; xxvii, p. 114] carried into the field by insects from surrounding weeds and crops. These aphids differed from those which breed in large numbers on stocks locally, and were found to feed only briefly on the plant before dying, but some success has already been achieved in their control.

Kreitlow (K. W.). **Susceptibility of some species of Trifolium, Medicago and Melilotus to Erysiphe polygoni.**—*Plant Dis. Reptr*, xxxii, 7, pp. 292–294, 1948. [Mimeographed.]

Following the infection during the winter of 1947–8 of several species of forage legumes by *Erysiphe polygoni* [*R.A.M.*, xxv, p. 455] in a greenhouse at the United States Regional Pasture Research Laboratory, Pennsylvania State College, containing heavily infected red clover plants, the reaction of each species was studied and the results compared with those obtained by Blumer [ibid., xiii, p. 127] and Yarwood [ibid., xv, p. 659]. Striking differences occurred. *Trifolium dubium* and *T. procumbens* were heavily infected though previously reported to be resistant, whereas *T. fragiferum*, susceptible in previous work, remained free from infection. The results indicate physiologic specialization.

Suneson (C. A.). **Wild Oat selections resistant to rust.**—*J. Amer. Soc. Agron.*, xl, 4, pp. 374–375, 1948.

In California the crown and stem [black] rusts of oats (*Puccinia coronata* and *P. graminis avenae*) are maintained throughout the dry summer and autumn on occasional volunteer plants germinated and sustained by irrigation. The wild oat (*Avena fatua*), a weed on cultivated land but also an important fodder grass in California, starting growth in September is vegetatively prime for continuous overwinter production of the uredospores of both rusts. Such carriers, which have been located in March of each year since 1941, serve as foci for the spread of infection to the large contiguous wild oat populations arising from seed germinated by winter rains. From such a site, known to have been visited by severe rust epidemics for three successive years, 15 plants classified as resistant to both pathogens were selected on 18th May, 1945. Earlier in the same year the plants on a portion of this site had been attacked exclusively by *P. coronata*, and its mode of dissemination charted [*R.A.M.*, xxv, p. 470], but since that time there has been no epiphytotic of the disease. The crown rust races collected on the site in 1945 were identified by H. C. Murphy, Iowa Agricultural Experiment Station, as 11 and 28.

In a single test in 1946 the low rust incidence on the susceptible controls precluded the definite establishment of resistance in the selected lines of *A. fatua*. However, in 1946–7, when four periodical plantings were made, the maximum degree of infection by *P. graminis* among five of the best selections (in the sowing of 20th October) was expressed by the rating 3-C in a scale of ascending severity from 1 to 4, representing moderate infection with chlorosis round the uredosori.

The highest ratings in the plantings of 28th November, 14th January, and 16th July were 2 (light infection), 2, and 1 (very resistant), respectively. Severe infection (4) occurred on control random collections in all the sowings. The maximum and minimum rust percentages shown by selections in the two early plantings (no figures are given for the later ones) were 15 and 3 and 10 and 0·3, respectively, compared with 100 and 40, respectively, in the random population. According to physiologic race identifications reported by E. C. Stakman from the Minnesota Agricultural Experiment Station, the selections were screened in the presence of race 2 of *P. graminis* in 1945 and exposed to it in 1947. It seems evident, therefore, that these selections are endowed with practical resistance to the race in question. There are indications, moreover, that the genetic basis for resistance is not the same in all five lines.

Kent (W. G.). **Fruit and vegetable storage. Report of conference held at Sittingbourne on March 3, 1948.**—*J. Minist. Agric.*, lv, 2, pp. 78–80, 1948.

At this conference J. C. Fidler stated that scald [*R.A.M.*, xvi, p. 541; xviii, p. 117; xxvii, p. 137 *et passim*] is rare in Cox and Worcester apples, while Edward VII, Lane's Prince Albert, and Bramley's Seedling are intermediate, and Newton Wonder very susceptible. It was emphasized that the damage actually occurs during the first three to six weeks' storage when the composition of the atmosphere [ibid., xxvii, p. 368] should be watched carefully but it is undesirable to lower the optimum carbon dioxide content to counteract scald.

Davis (M. B.) & Hill (H.). **Orchard soil management and Apple nutrition.**—*Tech. Bull. Dep. Agric. Can.* 65, 28 pp., 9 figs., 6 col. pl., 1948.

This publication is a revised edition of 'Apple Nutrition' (*Tech. Bull. Dep. Agric. Can.* 32, 1941). The first section (pp. 5–14) deals with the various aspects of soil management in young and bearing apple orchards by cultural methods. In the second section (pp. 15–28) the nutrient requirements of apple trees are discussed. Deficiency symptoms [*R.A.M.*, xxvii, p. 74] for nitrogen, potassium, phosphorus, calcium, magnesium, boron, iron, manganese, and zinc and their detection by symptomatic diagnosis are described. No instances of zinc deficiency in Canadian apple orchards have yet been recorded. General fertilizer recommendations and a suggested manurial programme appear at the end of the bulletin.

Walsh (J. C.). **Zinc deficiency in deciduous trees.**—*J. Dep. Agric. Vict.*, xlvi, 7, p. 320, 1 fig., 1948.

Recommendations are given for the control of zinc deficiency or little leaf of deciduous [fruit] trees [*R.A.M.*, xxv, p. 505; cf. xxvii, p. 424], symptoms of which have appeared in parts of the Goulburn Valley and Horsham district of Victoria.

Cass Smith (W. P.), Harvey (H. L.), & Goss (Olga). **Apple scab outbreaks, season 1947–48, with special reference to the introduction of the disease by infected buds on imported nursery stock.**—*J. Dep. Agric. W. Aust.*, Ser. 2, xxv, 2, pp. 129–135, 5 figs., 1948.

Evidence indicates that the sporadic outbreaks of apple scab (*Venturia inaequalis*) [*R.A.M.*, xxiv, p. 63] in Western Australia have all originated from imported nursery stock. Following the importation of 80,000 nursery stocks from Victoria and Tasmania in the winter of 1947, numerous new apple scab outbreaks were observed the next season on the newly introduced trees or stocks in spite of their having been dipped in strong Bordeaux mixture and freed of leaves.

A new record for Australia was constituted by the detection of bud scale infections on Pomme de Neige apple seedling stocks from Tasmania, and on Northern Spy and Cleopatra from Victoria. On the infected buds were found spores and

perithecia-like bodies closely resembling the ascospores and perithecia of *V. inaequalis.*

It was recommended that all plantings of varieties in which apple scab was detected should be destroyed and other varieties in adjacent plantings cut back to basal dormant buds. In addition, in nurseries, a thorough spraying with a suitable fungicide was advised. Approximately 3,700 young trees or stocks were destroyed and about 19,000 cut back. As no safe treatment is known for the disinfection of infected buds and the introduction of nursery stock under quarantine would be extremely difficult, the complete exclusion of imported stocks and the use of local stocks only appears to be the best means of excluding the pathogen. Recently regulations to this effect have been proclaimed under the Plant Diseases Act.

HILDEBRAND (E. M.). **Perennial Peach canker and the canker complex in New York, with methods of control.**—*Mem. Cornell agric. Exp. Sta.* 276, 61 pp., 18 figs., 2 graphs, 1947.

Investigations, covering eight years, into the peach canker complex in New York State indicated that *Valsa cincta* and *V. leucostoma* [*R.A.M.*, xxii, p. 290] cause the severe perennial cankers, while short-lived cankers are caused by *Monilinia* [*Sclerotinia*] *fructicola* and *Fusicoccum amygdali* [ibid., xx, p. 214]. The latter is regarded as very similar to, if not identical with, the conidial state of *Diaporthe eres* [ibid., xxi, p. 310].

The perennial cankers are located at pruning wounds, blossom and fruit spurs, fruit pedicels, dead or injured leaders or twigs, dead buds, and at various sites of winter and mechanical injuries. A few cankers on the trunk and scaffold branches are more destructive than many on the smaller stems. The girdling becomes less frequent in older trees, but the cankers are weak points, where the heavy branches may break off.

Out of 999 cankers examined, 75 per cent. yielded pathogenic fungi, of which 55 per cent. were *V. cincta*, 39·8 per cent. *V. leucostoma*, 4·8 per cent. *S. fructicola*, and 0·4 per cent. *F. amygdali*.

Pathogenicity tests demonstrated that *V. cincta* was a severe pathogen and *V. leucostoma* a weak one in spring and autumn, whereas *S. fructicola* and *F. amygdali* were rapidly acting pathogens during the growing season.

The approximate minimum, optimum, and maximum temperatures for the growth of *V. cincta* were 3°, 20°, 30° C., for *V. leucostoma* 3°, 30°, 39°; *S. fructicola* 6°, 24°, 33°; and *F. amygdali* 6° to 9°, 27°, and 36°.

The preventive measures include the planting of new peach orchards at safe distances from diseased ones, spring pruning, prevention of winter injury by stopping cultivation before mid-July, control of brown-rot cankers (which predispose trees to perennial cankers), and prevention of insect injury.

Laboratory tests showed that mercuric chloride, mercuric cyanide, and the dinitro compounds elgetol and nitrokleenup were very toxic to all the peach fungi tested. In preliminary field experiments no injury was caused by these compounds. Water asphalt emulsion was the most effective wound dressing. Surgical treatment of young perennial cankers proved highly successful in eradicating them, but the control of older cankers by this means rarely exceeded 75 per cent.

CARDINELL (H. A.) & MITCHELL (A. E.). **Packing house trials to reduce Peach-rot.** —*Quart. Bull. Mich. agric. Exp. Sta.*, xxx, 4, pp. 460–467, 2 figs., 1948.

In 1947, a year of heavy infection of brown rot (*Monilinia* [*Sclerotinia*] *fructicola*) [*R.A.M.*, xxvii, pp. 139, 173] in Michigan peach orchards, a test load of commercially packed Elberta peaches, after brushing and dusting with sulphur plus 10 per cent. zerlate, were hydrocooled at the Millburg Growers Exchange by slow conveyance

through an 'F.M.C. Stericooler' (a product of the Food Machinery Corporation), consisting of a tank 25 by 8 ft. containing about 2,000 gals. of 32° F. ice water in which 130 p.p.m. hypo-clor, a chlorine-type germicide, were maintained. The rate of travel "through a torrential downpour of treated ice water" determined the temperature of the fruit when it reached the end. From the belt the open wooden boxes were covered and conveyed to the cold-storage room. Peaches entering at 80° and completing passage in about 15 minutes left the machine at 45°. Half of this load, stored for seven days at 75° to 80° developed 39 per cent. rot and the rest, held for seven days at 40° plus four days at 75° to 80°, 23 per cent. Corresponding lots similarly treated but not hydrocooled developed 61 and 44 per cent. rot, respectively. To refrigerate to an average temperature of 42° about 13 lb. artificial ice per bush. peaches are required.

The most vulnerable points for entrance of rot organisms were the stem end and the point of contact with infected fruit. Storage at 40° after treatment reduced the percentage of fruit infected by the latter means from 16·4 to 5·6 per cent. in the precooled and from 25·4 to 9·2 for those dusted only.

Nicolas (G.) & Aggéry (Mlle [Berthe]). **Le dépérissement de l'Abricotier dans la région de Prades.** [Apricot wilt in the vicinity of Prades.]—*C. R. Acad. Fr.*, xxxiv, 5, pp. 252–254, 1948.

Observations were made in an eight-year-old orchard of 84 apricot trees grafted on Reine-Claude plum at Prades (eastern Pyrenees) in April and at the end of June, 1947; wilt had been present for two years and the symptoms displayed were those described by Chabrolin [*R.A.M.*, ix, p. 255]. The authors agree that the term 'apoplexy' [ibid., xxvi, p. 495; xxvii, p. 139] does not fitly describe the condition, since the progress of the disease is gradual. Thirty-nine trees were dead, while of the remainder some showed branch withering and others had yellowish up-curled leaves bearing small brown spots. Some of the trees which in April had all their leaves (though yellowed) were dead in June. Cracks, cankers, and clots of gum were noted on the trunks and branches. No organism was found externally associated with the condition.

Anatomical examination of young branches taken from a dying tree in April showed the characteristic brown discoloration of the phloem; numerous bacteria were present in the tissues, as noted by Rines in 1929 [ibid., viii, p. 388]. The pruning affected during the first four years without antiseptics may have allowed entry to micro-organisms. The orchard had been regularly irrigated. The soil was in good cultural condition and had received proper fertilizer treatments.

Taylor (C. F.). **Cost of Cherry leaf spot in West Virginia in 1945.**—Reprinted from *Mountaineer Grower*, xvii, 163, 6 pp., 1947. [Received June, 1948.]

Considerable losses from cherry leaf spot [*Coccomyces hiemalis*: *R.A.M.*, xxvii, pp. 173, 175] were reported from Berkeley and Jefferson counties in West Virginia in 1946 owing to poor control in 1945. A cumulative spray experiment in which blocks of two-year-old cherry trees were sprayed with lime-sulphur (2–100), Bordeaux mixture (2–8–100), and fixed copper (copper hydro 40, 3–3–100) was carried out from 1939 to 1946, four applications being made each season. In those seasons when leaf spot developed in early summer the unsprayed and lime-sulphur-sprayed trees became defoliated at the end of August, resulting in restricted growth when compared with the copper-sprayed trees. Those sprayed with copper hydro and Bordeaux averaged at the time of writing 25 per cent. greater trunk diameter than the trees sprayed with lime-sulphur. In 1945, a year of early infection, lime-sulphur-sprayed trees had lost 98 per cent. of their leaves by 21st July whereas trees sprayed with Bordeaux or copper hydro retained their leaves throughout the season. The heavy defoliation on the lime-sulphur plots was followed by the

branches being killed during the winter, early blossoming, and a reduction in yield (average 0·25 lb. on the ten lime-sulphur-sprayed trees). In 1946 the leaf-bearing area on these trees averaged only 59 sq. ft. compared with 151 sq. ft. for the copper-sprayed trees. The copper-hydro-sprayed trees produced a crop 75 per cent. greater than did Bordeaux-sprayed trees of equal size partly due to the smaller-sized fruit on the latter trees.

The results show the remarkable protection against leaf spot and defoliation achieved by the fixed copper and Bordeaux. The value of these sprays was enhanced by the fact that only four applications were sufficient to give fairly good control of leaf spot on single trees, randomly distributed and exposed to considerable infection from surrounding unsprayed trees. Since winter hardiness is correlated with high carbohydrate reserves it appears safe to assume that the winter injury was due to lack of these carbohydrates brought on by early defoliation and further depleted by the development of the secondary growth.

A questionnaire submitted to West Virginia growers showed that 18 owned 227·5 acres of trees capable of producing 1,338·9 tons in 1946. The tonnage harvested amounted to 719·6. Of the missing 618·3 tons, 230·4 were believed lost due to spring frosts and 387·9 to the 1945 leaf spot epidemic.

PRENTICE (I. W.). **Resolution of Strawberry virus complexes. II. Virus 2 (mild yellow-edge virus).**—*Ann. appl. Biol.*, xxxv, 2, pp. 279–289, 1 pl., 1948.

In this further account of work on the resolution of strawberry virus complexes, some of the results of which have already been noticed [*R.A.M.*, xxv, p. 459], the author refers to virus 1, believed to be the mild crinkle virus, and virus 2 or mild yellow-edge virus.

Virus 1 is transmitted occasionally after an infection feeding period of one hour and is readily transmitted after 24 hours. Virus 2 is transmitted occasionally after a feeding period of 24 hours, but more often after three to four days' feeding. Virus 1 persists only for a few hours in the vector, whereas virus 2 persists for several days, nevertheless both are regarded as of the persistent type [ibid., xxv, p. 245]. Symptoms appear on wild strawberry (*Fragaria vesca*) in two to three weeks with virus 1 and four to eight weeks with virus 2. The symptoms of virus 2 resemble the mild symptoms of virus 1, but virus 2 is generally distinguishable by the leaf cupping and marginal chlorosis it causes. On Royal Sovereign virus 1 produces a faint chlorotic spotting, virus 2 causing a slight leaf chlorosis, tending to be marginal but difficult or impossible to detect on recently infected plants.

Virus 2 was transmitted from wild strawberry to Royal Sovereign and vice versa by grafting, with consistent production of appropriate symptoms, but in some aphid experiments two types of symptoms were produced by virus 2, some of the *F. vesca* indicators developing symptoms much milder than those typical of virus 2; cupping and marginal chlorosis were almost entirely absent, and the only symptoms were slight but definite chlorotic mottle, intervenal necrosis on the older leaves, and slight loss of vigour. It may be that the fraction described as virus 2 is itself a complex capable of further resolution, or the mild symptoms may be due merely to the isolation of a milder strain of virus 2. For the present, however, virus 2 is regarded as a single virus.

MILLER (P. W.). **Studies on the cause of Strawberry root rot in Oregon: second report of progress.**—*Plant Dis. Reptr*, xxxii, 7, pp. 309–316, 1 pl., 1948. [Mimeographed.]

Further investigations into the cause of strawberry root rot in Oregon [cf. *R.A.M.*, xxvi, p. 400] carried out from 1947 to 1948 were concerned primarily with further isolations from root lesions on plants collected from several different plantings in widely scattered localities in western Oregon. In addition to the widespread

red stele [red core] (*Phytophthora fragariae*) there are two well-defined types of cortical root rot, viz., brown root rot, with typically local lesions, and black root rot with more extensive cortical rot.

As before, several different fungi were found associated with lesions, the group most consistently present under all soil conditions being various species of the genera *Fusarium*, *Ramularia*, *Chaetomium*, *Rhizoctonia* [ibid., xxvii, p. 430], *Penicillium*, *Pestalotia*, *Mucor*, and *Oothecium*, the first three being the most prevalent in that order. Other fungi occasionally isolated and not previously recorded were *Phoma*, *Coniothyrium*, *Rhizopus*, *Cladosporium*, *Mycogone*, *Aspergillus*, and *Alternaria* spp. *Rhizoctonia*, *Fusarium*, and *Ramularia* spp. proved most pathogenic under greenhouse conditions.

A black root condition was produced when the roots became desiccated during digging and transplanting and experimentally by exposure to the air for certain periods. The higher the temperature and the lower the humidity, the shorter was the period required to produce black roots, as little as one hour of desiccation being required when they were air-dried in the sun at 30 per cent. or less humidity.

BRUN (J.). **La maladie de Sigatoka ou cercosporiose du Bananier (Mycosphaerella musicola Leach—Cercospora musae Zimm.).** [Sigatoka disease or cercosporiosis of the Banana plant (*Mycosphaerella musicola* Leach—*Cercospora musae* Zimm.).]—*Rev. Mycologie, Suppl. colon.*, xii, 3, pp. 71–83, 1 fig., 2 diags., 1947. [Received March, 1948.]

Banana leaf spot caused by *Mycosphaerella musicola* [*R.A.M.*, xxvii, p. 412] has been present in Africa [ibid., xix, p. 294; xxiii, p. 410; xxvi, p. 145] for some years; it has been reported from the Cameroons by Heim [*Rev. Mycologie, Suppl. colon.*, xi, 1, pp. 38–41, 1946], and diseased samples have recently been received from the regional station of the Institut des Fruits et Agrumes Coloniaux at Nyombe.

The fruits of affected plants take much longer to form than those of healthy plants owing to depleted reserves in the rhizomes. When the attack is slight only the quality of the bananas is affected while in severe cases the size of the fruit is reduced, the smell modified, and they become soft and pulpy, buff to ochre in colour, and unsaleable.

The control measures most frequently employed consist of three spray cycles using 0·5 per cent. Bordeaux mixture at 7,000 l. per hectare plus a wetter or sticker to kill the conidia in the acervuli. Perenox (0·1 per cent.) is occasionally used to check their development by poisoning the dew.

The author considers that the disease is likely to spread throughout the coastal region of French Equatorial Africa unless energetic measures are taken for its arrest.

CERIGHELLI (R.). **Dégâts provoqués par le Thielaviopsis paradoxa sur les Ananas frais.** [Damage caused by *Thielaviopsis paradoxa* to fresh Pineapples.]—*Fruits d'Outre-Mer*, iii, 7, p. 260, 2 figs., 1948.

Examination at Marseilles of fresh pineapples immediately after unloading showed that 85 to 90 per cent. of the fruits were in an advanced state of fermentation and when cut open displayed the brown discoloration characteristic of the early stage of infection by *Thielaviopsis* [*Ceratostomella*]; the microscopic characters of the fungus showed it to be probably *C. paradoxa* [*R.A.M.*, xxvii, p. 375]. Growers are again advised to disinfect pineapples before dispatch to market.

BALAKRISHNAN (M. S.). **South Indian Phycomycetes. I. Pythium indicum sp. nov. causing a fruit rot of Hibiscus esculentus Linn.**—*Proc. Indian Acad. Sci.*, Sect. B, xxvii, 6, pp. 161–173, 2 figs., 1 pl., 1948.

In October and November, 1946, *Hibiscus esculentus* fruits at Podanur, Coimbatore, India, suffered considerably from a rot causing yield reductions of over

50 per cent. The affected fruits bore large, water-soaked, sunken, brownish lesions covered with a sparse, fluffy, aerial, white, non-septate mycelium and producing a marshy odour. Numerous oogonia, antheridia, and oospores were present. When pieces of mycelium were transferred to water filamentous *Pythium* sporangia developed in 12 to 15 hours.

The fungus grew most luxuriantly on oatmeal agar, covering a 10-cm. Petri dish completely in 36 hours at 26° to 27° C.

Plants of tobacco, *Nicotiana glutinosa*, eggplant, *Solanum nigrum*, chilli (*Capsicum*), tomato, *Petunia*, papaw, squash (*Cucurbita maxima*), maize, *Amaranthus gangeticus*, *H. esculentus*, and cowpea, inoculated in the shoots or leaves or both, developed characteristic symptoms resulting in complete decay of the fruits after 4 to 7 days and death of some plants after 4 to 18 days.

The only species of *Pythium* so far recorded on *H. esculentus* is *P. debaryanum* [*R.A.M.*, v, p. 752]. The present fungus resembles *P. indigoferae* [ibid., xv, p. 244; xx, p. 591] and *P. deliense* [ibid., xiv, p. 473] in the bending of the oogonial stalk towards the antheridium, but it differs from the former in its more vigorous growth on various media and in its production of intercalary oogonia and antheridia. It differs from *P. deliense* in its abundant aerial mycelium, its simultaneous production of both sporangia and sex organs, its abundant production of appressoria, and the long sporangial evacuation tube. It is considered to be a new species and is named *P. indicum* sp. nov. It has hyphae measuring 4 to 12 μ, mostly 8 to 10 μ in diameter. The terminal, infrequently intercalary, inflated, filamentous sporangia are up to 250 μ long, are wider than the parent hypha, and provided with lateral lobes though never forming intricate complexes. The zoospores (25 to 150) measuring 12 to 15 by 10 μ while swimming and 10 to 12 μ in diameter when encysted, are monoplanetic and germinate by the production of one to three germ-tubes. The spherical, subspherical, or barrel-shaped oogonia are terminal or intercalary, smooth-walled, and are 12 to 24 μ in diameter. The monoclinous, rarely diclinous, single antheridia have usually a straight stalk, the oogonial stalk being bent towards it. The filamentous-clavate, terminal or rarely intercalary antheridium, which often has a distal lobe, makes apical contact with the oogonial wall. The moderately thick fertilization tube is clearly visible. The smooth, aplerotic oospores, 10 to 20 μ in diameter, have a moderately thick wall and contain a single reserve globule and a single refringent body.

1947 fungicide tests : a summation of nation-wide results with newer fungicides.— *Plant Dis. Reptr, Suppl.* 176, pp. 95–142, 1948. [Mimeographed.]

This report, compiled by a sub-committee comprising H. P. Barss *et al.* of the Fungicide Committee of the American Phytopathological Society, on the performance of more than 130 of the newer fungicides used on various fruit, vegetables, and ornamental plants including shade trees and turf, and as seed treatments for cereals and cotton, is based on information received from about 145 plant pathologists in 47 States and Provinces of the United States and Canada. The fungicides used in the experiments are listed, and the chemical formulae and names of the manufacturing companies are specified.

From the results with fruit diseases phygon was shown to give consistently the best control of apple scab [*Venturia inaequalis*], though lacking in safety. It was also effective in Delaware against peach brown rot [*Sclerotinia fructicola*] in the blossom phase, whereas in other test applications to growing and mature fruit it was not so satisfactory as sulphur or the dithiocarbamates. Fermate [*R.A.M.*, xxvi, p. 347] gave especially good results in the control of apple rust [*Gymnosporangium juniperi-virginianae*: loc. cit. and xxvii, p. 174], Brooks's fruit spot of apples [*Phoma pomi*: ibid., xxv, p. 398] (ranking equally with copper materials), apple blotch [*Phyllosticta solitaria*], pear scab [*V. pirina*] (equally zerlate), black

rot of grapes [*Guignardia bidwellii*: ibid., xxvi, p. 182], and raspberry leaf diseases. The chromates, especially 169, appear promising in the control of early and late blights of potatoes [*Alternaria solani* and *Phytophthora infestans*]; dithane Z-78 also gave encouraging results in the control of several vegetable diseases [ibid., xxvi, p. 472]. Excellent results were obtained by using combinations of dithiocarbamates, e.g., zerlate-parzate, on potatoes, tomatoes, and cucurbits. Applications of ceresan M proved useful for treating seed of barley, oats, wheat, and flax; Dow B for cotton, maize, and groundnuts; mycotox for cotton; and phygon for cereals, sugar beet, and vegetables.

Hamner (C. L.) & Tukey (L. D.). **A simple device for applying ground sprays.**—*Quart. Bull. Mich. agric. Exp. Sta.*, xxx, 4, pp. 468–472, 4 figs., 1948.

Details are given of the construction of an inexpensive, easily operated sprayer suitable for fungicides developed at Michigan State College, from an ordinary 3-gal. hand-sprayer, mounted on a hand garden cultivator and equipped with a 4-nozzle ($\frac{1}{4}$-in.) spray boom which can be clamped to the cultivator at any convenient height. A petrol filter is used to remove all large particles that might clog the nozzles. There is a hand-operated shut-off valve. The sprayer will cover a swathe 8 ft. wide and, with a small delivery and rapid walking rate it is possible to cover several acres in a day using only 3 gals. concentrated spray material per acre.

Perotti (R.). **Biologia vegetale applicata all' agricoltura.** [Plant biology applied to agriculture.] **I. Generalità'. Malattie non-parassitarie.** [I. Generalities. Non-parasitic diseases.]—10+895 pp., 221 figs. (5 col.), 26 graphs, 1948, Lire 5,600 or $10; **II. Batteriologia.** [II. Bacteriology.]—x+1057 pp., 2 col. pl., 221 figs. (3 col.), 47 graphs, 1943. Lire 5,600 or $10; **III. Micologia—Malattie parassitarie.** [III. Mycology—Parasitic diseases.]—x+1191 pp., 1 col. pl., 395 figs. (2 col.), 5 graphs, 1940. Lire 8,600 or $15. All second editions, Turin, Rosenberg & Sellier. [Received October, 1948.]

This first volume of a work in which the author's aim has been to co-ordinate the facts of plant biology in their fundamental application to agriculture includes, *inter alia*, chapters dealing with symbiosis (pp. 301–326), defects of functional correlation (pp. 327–348), defective symbiosis (pp. 349–372), pathology of grafting (pp. 393–418), etiology and therapy (pp. 459–484), light, and diseases due to excessive or deficient light (pp. 485–536), to excessive or insufficient heat (pp. 537–558), to electricity and magnetism (pp. 601–622), to excess or insufficiency of water (pp. 623–648), of organic matter in the soil (pp. 675–694), of nutrients (pp. 695–742), to mechanical causes (pp. 743–776), and to poisons (pp. 777–814).

In volume II, in which O. Verona has collaborated, chapters are devoted, *inter alia*, to the chemical composition of bacteria (pp. 31–48), the principles of microscope measurement (pp. 79–114), cellular constitution (pp. 143–158), vital staining (pp. 183–222), nutrition (pp. 223–240), respiration and fermentation (pp. 241–268), reproduction (pp. 367–392), systematics of the bacteria (pp. 393–444), and nitrogen fixation and symbiosis (pp. 631–686).

In volume III [*R.A.M.*, xx, p. 128] the author deals with mycology and parasitic diseases, each disease being approached from the following standpoints: history, symptoms, biology of the parasite, parasite-host relations, conditions governing infection, and control. The opening chapters deal, respectively, with parasitic diseases in general (pp. 1–30), bacterial diseases causing neoformations (pp. 31–62), tumours and cankers (pp. 63–94), pathological anatomy (pp. 95–122), bacterial diseases causing necrosis (pp. 123–190), diseases caused by ultra-microscopic organisms (pp. 191–240), and are followed by 22 chapters each treating the diseases caused by a specific group of fungi, and two final chapters on the parasitism of the

algae (pp. 1007–1050), and immunity and general methods of disease control (pp. 1051–1092).

Gäumann (E.). **On the term 'resistance' in plant pathology.**—Reprinted from M.O.P. Iyengar Commemoration Volume, *J. Indian bot. Soc., 1946*, pp. 87–89, 1947.

The author expresses the view that the terms 'resistance' and 'resistant', as used in plant pathology, no longer correspond to one well-defined significance. At present, they are employed to mean either (*a*) a definite degree of susceptibility, as in the disease index scales, or (*b*) definite causes or definite material elements in this greater or lesser susceptibility. This latter includes two notions which can best be understood by a comparison with human warfare: static resistance corresponds to the natural objects (mountains, etc.), which oppose an invading army, while dynamic resistance corresponds to the active defence of a country by its people. For the sake of simplicity the author has proposed in a recent book [*R.A.M.*, xxv, p. 173; see also xxvi, p. 22] to differentiate clearly between the insufficient suitability of a plant to act as host and its insufficient readiness or 'willingness' to do so. He calls the former condition 'axeny'; it is present before infection, is essentially passive (an axenic plant is not literally 'resistant', but is merely 'not liable to infection'), it depends on inherited factors existing independently of the pathogen, and finally it means a general inhospitality of the organism, whereas defensive reactions are 'intentional' for protection against a specific disease.

Dexter (S. T.). **A colorimetric test for estimating the percentage moisture or the storage quality of farm products or other dry materials.**—*Quart. Bull. Mich. agric. Exp. Sta.*, xxx, 4, pp. 422–426, 2 col. pl., 1948.

A colorimetric method has been devised for reading over a wide range the degree of dampness of stored farm products [cf. *R.A.M.*, xxvii, p. 325]. A small sample of the material to be tested is shaken up to 200 times in a glass container with a small quantity of water adsorbent, potassium thiocyanate, or common non-iodized table salt. With the former is added ferric sulphate which reacts to produce gradual colour change from almost white to deep red indicating a range of moisture content from 7 to 12 per cent. in oats or wheat. To the latter adsorbent are added anhydrous ferric ammonium sulphate and potassium ferrocyanide, which react to give a range from almost white to deep blue indicating a moisture content range from 12 to 17 per cent. The adsorbents become wet and sticky when the moisture content of the grain exceeds 11 and 15 per cent. for each chemical, respectively. These numerical values apply only to oats or wheat. The method can also be used for paper, wood, flour, tobacco, sugar, starch, hay and flax seed, appropriate calibration of the colour ranges for each product being necessary. In testing ground-mill feeds or flour it is advisable to place the chemical in a tissue paper envelope to avoid contamination of colour dilution by the sample. The tests should be done at or near the temperature at which storage is to take place.

Scarth (G. W.), Loewy (A.), & Shaw (M.). **Use of the infra-red total absorption method for estimating the time course of photosynthesis and transpiration.**—*Canad. J. Res.*, Sect. C, xxvi, 1, pp. 94–107, 1 fig., 9 graphs, 1948.

A modification of Dingle and Pryce's apparatus [*Proc. roy. Soc.*, cxxix, pp. 468–474, 1940] for determining the concentration of carbon dioxide in air by non-spectroscopic measurement of its absorption of infra-red is described. Its greater accuracy enables less than one part per million of carbon dioxide to be measured at speeds from 10 min. intervals to continuous reading. The use of the technique in following the time course of photosynthesis and transpiration is described.

Weatherburn (Muriel W.). **The rot-proofing of textile and related materials—a survey of literature.** pp. iii+184, Publ. No. 1601, National Research Council of Canada, Ottawa, 1947. [Mimeographed.]

This comprehensive survey of literature dealing with rotproofing of textiles comprises chapters on inorganic, metal-organic, and organic compounds (the latter being subdivided into arbitrary divisions of phenolic, nitrogen-containing, and sulphur-containing compounds and dyes), natural products, and mixtures of compounds. The compounds dealt with are listed alphabetically under the name of the compound with notes on their use and references to an extensive bibliography of 383 titles. Tabulated data on the action of large numbers of compounds from published sources are given on pp. 89–145. A complete classified list of the compounds dealt with, and a manufacturer's list of rot-proofing compounds with the active ingredient specified, are appended.

H[arvey] (C.). **Food losses caused by insects and mould fungi.**—*Agric. J. Fiji*, xix, 1, p. 11, 1948.

Copra dried to a moisture content of six or seven per cent. suffers little if any breakdown from moulds or insects. C. L. Southall [*Agric. J. Fiji*, i, 3, p. 29, 1927] has shown that copra dried to 8·8 per cent. moisture content (a figure much below that of some of the copra in Fiji to-day) could lose 9 per cent. of its dry weight during six weeks' storage, or that dried to 15 per cent. could lose 20 per cent. If a low average figure for preventable loss through moulds and insects of, say, 5 per cent. is taken at present, this represents 1,700 tons of the 1947 production of 34,916 tons. At £40 per ton, this loss amounts to £68,000. Hence, producers could afford to spend £50,000 a year on improving copra by better drying.

Jacobs (S. E.) & Marsden (A. W.). **The role of antibiotics in the decomposition of sawdust. II. Inhibition of the growth of cellulose-decomposing fungi.**—*Ann. appl. Biol.*, xxxv, 1, pp. 18–24, 1948.

In examining the antibiotic effect of deal sawdust (from a variety of white coniferous woods) on the growth of cellulose-decomposing fungi on Czapek-Dox agar, the authors found that *Stachybotrys atra* [*R.A.M.*, xxvii, p. 291] and *Chaetomium indicum* [ibid., xxvii, p. 378] were strongly inhibited by the autoclaved cold water extracts of sawdust, but *C. globosum* [ibid., xxvii, p. 436] only slightly so. The extracts also contained substances which stimulated the growth of *C. globosum*, but not that of the other fungi. The formation of perithecia by *C. indicum* and *C. globosum* was also stimulated by the extract but the growth of species of *Aspergillus* and *Penicillium* was neither inhibited nor stimulated.

Sproston (T.), Little (J. E.), & Foote (M. W.). **Antibacterial and antifungal substances from Vermont plants.**—*Bull. Vt agric. Exp. Sta.* 543, 7 pp., 1948.

Of 73 plant extracts tested for antibacterial and antifungal activity [*R.A.M.*, xxiv, p. 479; xxvi, p. 119] that from *Impatiens biflora* was most toxic to *Sclerotinia fructicola*, *Colletotrichum lindemuthianum*, and *Rhodotorula glutinis*. The bacteria tested were not outstandingly sensitive to any of the extracts. Further work is in progress.

Loest (F. C.). **Plant diseases and cultural operations.**—*Fmg S. Afr.*, xxiii, 267, pp. 383–385, 1948.

The main conditions contributing to the incidence of dry root rot and *Diplodia* gummosis in citrus caused by *D. natalensis* [*R.A.M.*, xxvii, p. 351], avocado root rot caused by *Phytophthora cinnamomi* [ibid., xxvii, p. 327], and foot rot of papaw caused by *Pythium* spp. are impaired soil aeration and changes in the nitrogen

level brought about by excess water. Many parasitic soil organisms have a lower oxygen requirement than the roots of higher plants and can grow in aqueous solutions that injure or kill such roots. Soils in poor physical condition also aggravate these diseases. The formation of a hard pan or impervious layer beneath the soil surface, planting on impervious subsoil, over irrigation, and uncontrolled irrigation by planting too many trees in a run all tend to create a waterlogged condition which favours the development of the root rot organisms. *Phytophthora citrophthora* [ibid., xxvi, p. 12] is largely prevented by constructing basins 2 to 3 ft. in diameter, to prevent irrigation water from reaching the trunks of citrus trees. Seepage of water from furrows, springs, or reservoirs is a not uncommon factor inducing root decay in avocado, papaw, and citrus. Intercropping avocado and citrus orchards with vegetable crops that need constant irrigation sometimes leads to root rot and should be avoided. The vegetative vigour of the plant is closely related to the degree of parasitism of the organism attacking it (e.g., lemon trees may become heavily attacked by *D. natalensis* when leaching or insufficient nitrogen application has induced a low nitrogen level in the soil). There is a strong interdependence of plants, soil, disease, and climate. Unhygienic cultural methods are frequently the underlying cause of root diseases.

Mostafa (M. A.) & Naïm (M. S.). **Stimulation of adventitious root formation by fungal metabolic products.**—*Nature, Lond.*, clxii, 4119, pp. 575–576, 3 figs., 1948.

When freshly cut, healthy, wilt-resistant Ashmouni cotton shoots were placed in an unheated filtrate from a culture of *Fusarium vasinfectum* in Richards's solution, adventitious roots started to form on the fourth day, but no similar phenomenon was observed with the susceptible Giza 26 or with a heated filtrate. The aqueous solution of the precipitate, produced when the culture filtrates of *F. lycopersici* and *F. vasinfectum* were treated with 96 per cent. alcohol, stimulated adventitious root formation of North Dakota and Prichards tomato shoots, their development being more vigorous in the latter variety. The fungal metabolic substances responsible for root stimulation appear to be thermolabile and filterable through a Berkefeld filter. Further studies are in progress.

Roberts (F[lorence] M.). **Experiments on the spread of Potato virus X between plants in contact.**—*Ann. appl. Biol.*, xxv, 2, pp. 266–278, 1948.

This is the full account of field and glasshouse experiments at Rothamsted covering three years on the spread of five strains of potato virus X using seven potato varieties and also tomato plants [*R.A.M.*, xxvi, p. 120]. The strains used were X^M, a mild strain from symptomless Majestic stock seed; X^B, potato virus B [ibid., xxv, p. 73]; X^Y, a strain found in naturally infected Majestic and which causes a yellow mottle in Majestic, *Datura stramonium*, tobacco, and tomato; X^N [ibid., xxvi, p. 123]; and X^K [ibid., xxvii, p. 536], a strain from one shoot of a Majestic (stock seed) plant showing mosaic and necrotic spots. The virulent strains attain a high concentration in infected plants and spread more rapidly than the avirulent. In only one experiment with potatoes did more than 10 per cent. of healthy plants exposed to the virus become infected during one season. *D. stramonium* and tomato plants became infected when grown in soil containing sap or residues from infected plants. It was commonly found that in the field potato plants whose foliage gave no reaction for virus X yielded at the close of the season a mixed progeny of healthy and infected tubers, and such infections are attributed to underground spread. No instances of infection were observed except when healthy plants had been in direct contact with sources of the virus.

In conclusion it is pointed out that in work with potato virus X, unless potato plants are known not to have been in contact with any disease source, individual

tests on the tubers are necessary to ensure that they are virus-free. Tests on the foliage of the parent plants alone are not reliable.

Vasudeva (R. S.) & Azad (R. N.). **Potato necrosis.**—*Curr. Sci.*, xvii, 7, pp. 216–217, 2 figs., 1948.

Darjeeling Red Round potato plants, raised from virus-free seed tubers in an insect-proof house, developed dwarfing and curling of the leaves and necrosis of the growing point which progressed downward, ultimately killing many of the plants. Virus-free President and Craigs Defiance were affected by a similar disease, which, however, was not necrotic and did not result in the death of the plants.

The disease was successfully transmitted by grafting to healthy potatoes, (Phulwa, Craigs Defiance, President, Arran Victory), to Sutton's Early Market tomato, and to Harrison's Special tobacco which responded by mottling and foliar distortion. In transmission tests *Bemisia gossypiperda* was found to be the vector of the disease, transmitting it to tomato and tobacco after having fed for 24 hours on the infected material. Potatoes were not included in these tests, owing to the lack of sufficient virus-free stock.

The symptoms on the differential hosts show that the necrosis had been caused by a mild strain of tobacco leaf curl virus [*R.A.M.*, xxiv, p. 292].

Wilson (J. H.). **The use of the phloroglucinol test for diagnosis of leaf roll in Potatoes.**—*J. Aust. Inst. agric. Sci.*, xiv, 2, pp. 76–78, 1948.

In Tasmania, where the chief potato variety, Brownell, and also Up-to-Date (third in importance) are particularly susceptible, leaf roll [*R.A.M.*, ix, p. 332] has long presented a problem in seed potato production. The limiting factor in control has been difficulty of identification owing to the masking of symptoms in the field. Immediate success in identification, however, followed the use of a modification of Miss Sheffield's technique for detecting phloem necrosis [ibid., xxii, p. 447], concentrated hydrochloric acid (10 N) replacing the 50 per cent. recommended. Necrotic phloem turned pink to purplish-red and stood out very clearly. The observations agreeing with Sheffield's were: (1) stained areas characteristic of leaf roll infection were not seen except in the primary phloem region; (2) phloem necrosis appeared to be a constant, specific character of leaf roll plants; (3) rolling of leaves occurring as a varietal character (in new hybrids) and that due to *Rhizoctonia* [*Corticium solani*] were not accompanied by necrosis; (4) necrosis was present in the internal or external phloem or both, but was usually confined to the external. Cases were frequently encountered in which severity of external symptoms bore little or no relation to the amount of necrosis present. That some plants considered doubtful in the field should show severe internal necrosis, whereas others with marked leaf roll and dwarfing were only moderately necrotic, is evidence that leaf roll and necrosis are not related in the manner of cause and effect.

Jamalainen (E. A.). **The significance of Potato virus diseases in Finland.**—Reprinted from *Maataloust. Aikakausk., 1946*, 18, pp. 134–346, 1946. [Finnish summary.]

In most parts of Finland the incidence of potato virus diseases is negligible because of the climatic conditions. Owing to spring frosts potatoes are usually planted at the beginning of June in south Finland and in the middle of June in the rest of the country. The haulms frequently become frozen in the middle of September in the south, and earlier still elsewhere.

Mild mosaic [? potato mottle], streak [? potato virus Y], and crinkle [? virus X+virus *A*] occur mainly in the southern provinces of Turku, Pori, Uusimaa, and Häme, but the damage caused is usually insignificant.

Detailed observations, carried out during 1939–43 and in 1945 at the Hankkija Plant Breeding Station, near Helsinki, where imported potato varieties are received, showed that in experiments where tubers from the same plants were used year after year the Juli variety was 100 per cent. virus (crinkle+streak) diseased, Eigenheimer, Frühgold, Goldwährung, Up-to-Date, Bintje, and Magnum Bonum being 20 to 35 per cent. diseased. Flava, King George V, Konsuragis, Ostbote, Paul Wagner, Rosafolia, and Early Tammisto had on an average 3 to 10 per cent. disease. Virus diseases were especially abundant in 1941–2 but in other years infection was low. At the Piikkioo Agricultural Experiment Station early varieties seem to be more susceptible than late ones. At the Plant Cultivation Experiment Station, Pälkäne, some of the best cooking varieties, e.g., Preussen, Edda, and Goldwährung, have had to be abandoned because of virus diseases which are on the increase. Ostbote has remained completely healthy. Leaf roll and aucuba mosaic are practically absent. Rosafolia, the most cultivated potato variety, is highly resistant to all virus diseases.

It is suggested that in Finland the cultivation of virus free seed potatoes for export should be started, as there is a great demand for these in many countries.

Ollila (Laila). **Tuhosienien merkityksestä Perunavarastojen turmelijoina suomessa.** [On the significance of fungous diseases in stored Potatoes in Finland.] —*Maataloust. Aikakausk.*, 19, pp. 89–98, 1947. [English summary.]

The results of many years' studies in Finland of potato diseases in storage showed that about 10 per cent. of the damage is due to fungous diseases. Of these potato blight (*Phytophthora infestans*) [*R.A.M.*, xvii, p. 58] is the most serious, about 70 to 90 per cent. of stored potatoes being affected. Bacteria [unspecified] are responsible for the decay of the rest. *Fusarium solani* [ibid., xxv, p. 12], *F. sambucinum*, *F. merismoides*, and *F. avenaceum*, frequently isolated from stored potatoes, occur only as saprophytes. Only *F. caeruleum* was established as a parasite in a few cases, but is of little importance. The tubers also yielded several saprophytic species of *Cylindrocarpon*. The need for growing blight-resistant varieties is emphasized.

Scottish Society for Research in Plant Breeding. Report (abridged) by the Directors and Report of the Director of Research to the Annual Meeting, 29th July, 1948.—46 pp., 1948.

In this report of the Director of Research [cf. *R.A.M.*, xxvi, p. 74] W. Black and J. C. Haigh (p. 12) state that potato breeding experiments have yielded several selections which appear to be highly resistant to common and powdery scab [*Actinomyces scabies* and *Spongospora subterranea*, respectively]. Tests are being made to confirm that some exotic species are immune from blackleg [*Erwinia phytophthora*] with a view to their utilization in breeding experiments.

Seedlings 831 (113) and 835 a (4) compared favourably with the control varieties in the 1947 and 1948 Lord Derby Gold Medal Trials and have since been named respectively, Craigs Royal (field immune from viruses X and A) and Craigs Snow-White (immune from strains A and C of *Phytophthora infestans* [ibid., xxvii, p. 291] and field immune from viruses X, A, B, and C). Seedlings 833 b (98), 834 c (29), and 914 a (12) are immune from blight strains A and C while 1318 (3) is immune from blight strains A and B and from virus strains X, A, and B. Several seedlings including 833 b (98), Craigs Snow-White, and 914 a (12) have given encouraging results under tropical conditions and have so far remained free from blight in East and South Africa [ibid., xxvii, p. 224]. Some are being multiplied on a commercial scale for distribution to farmers.

Hitherto tests for field immunity to viruses X, B, A, C, and Y have been made exclusively by graft transmissions requiring a considerable amount of infected

material for scions and a long period before the virus can be recovered from susceptible varieties. G. Cockerham and T. M. R. M'Ghee (p. 18) state that by using leaf inoculation wherever possible, and serological tests for recovering the X viruses, time and space requirements have been greatly reduced and the number of tests each season correspondingly increased. The problem of leaf roll resistance is also being examined to determine the most efficient form of trial for obtaining adequate data on comparative resistance from a minimum number of tubers in a minimum of time.

A previously suspected immunity from virus Y of the non-susceptible type was confirmed in a variety of *Solanum rybinii*. The inheritance of this character and that of hypersensitiveness to virus Y was studied in seedling progenies.

Promising seedlings immune from two or more strains of *P. infestans*, field immune from viruses X, A, C, and Y and resistant to leaf-roll have been obtained.

An examination of 160 sources of virus X selected from material showing a wide variety of symptoms in 1946, has proved that the problem of differentiating strains is extremely complex. All varieties possessing the genes Nx and Nb are field immune from every recorded strain of virus X. A preliminary trial of the effects of virus X on yield revealed that infections with mild strains of the virus in the varieties Majestic and Kerr's Pink produced higher yields than in the uninfected controls.

A survey of plants infected with virus Y showed the presence of only one strain of this virus in the sources examined [ibid., xxvii, p. 332].

Informaciones de interés para los trabajos de selección de Papas resistentes a Phytophthora infestans. [Notes of interest for the work of selection of Potatoes resistant to *Phytophthora infestans*.]—*Hoja inform. Minist. Agric., B. Aires*, 10, 3 pp., 1948. [Mimeographed.]

Some of the physiologic races of *Phytophthora infestans* occurring in Argentina [*R.A.M.*, xxiii, p. 242] attack seedlings (the progeny of true seed), varieties, and wild forms of potato regarded in other countries as resistant or immune, denoting a high order of pathogenicity in the endemic population of the fungus. Six resistant United States seedlings, viz., C.V.I.–2, D.G.H.–9, D.K.N.–2, 96–44, B 76–43, and B 192–17 reacted as follows to two Argentine races in a scale ranging from 0 (immune) to 4 (maximum susceptibility): the stems of all were immune from isolation 358, while the grades of foliar infection were 0–1, 1, 1–2, 1, 1, and 0–1, respectively. The types of infection induced by isolation 167 were represented by grades 2 to 4 on the stems of each of the seedlings except B 192-17, which was immune, and by 3 to 4 on the leaves of all.

These data indicate that the development of resistance to the virulent races of the pathogen indigenous to the country will present great difficulties. Promising material for the purpose may be sought among the English seedlings 834 c (29) and 914 a (12) [see preceding abstract], and to a lesser extent in C.Z.K.–7 and 96–28 from the United States.

Hellmers (E.). **Kartoffelbrokkens Udbredelse i Danmark 1923–1946.** [The distribution of Potato wart in Denmark 1923 to 1946.]—*Ugeskr. Landm.*, xciii, pp. 103–104, 1 graph, 1948.

Since the publication in 1936 of Ferdinandsen's survey of potato wart [*Synchytrium endobioticum*] in Denmark [*R.A.M.*, xvi, p. 56], the disease has spread from its original main focus in southern Jutland to all parts of the country. The number of areas under quarantine, moreover, has risen steadily, the rate of extension having been particularly alarming since 1939, between which year and 1946, taking the country as a whole, 14 municipalities on an average have been banned

annually compared with eight to nine from 1923 to 1938, while the total number excluded from cultivation was 199 in 1946 as against 121 in 1935.

MUNCIE (J. H.) & MOROFSKY (W. F.). **Nitroacetate and nitrodithioacetates as Potato sprays.**—*Quart. Bull. Mich. agric. Exp. Sta.*, xxx, 4, pp. 445–447, 1948.

Results of tests carried out in 1947 at Lake City using Menominee potatoes and seven spray applications of zinc and copper nitrodithioacetates and copper nitroacetate combined with either DDT or benzene hexachloride as insecticides and using fixed copper and Bordeaux as controls, showed that in a season of light early blight [*Alternaria solani*] infestation the highest yield of U.S. No. 1 potatoes (262·3 bush. per acre) was obtained from the plots sprayed with a combination of zinc nitrodithioacetate and copper nitroacetate with DDT (1–1–1–100). All the new materials whether used alone or in combination gave significantly higher yields than Bordeaux mixture, fixed copper, genicop, or DDT alone. Plots sprayed with the new materials had only 1 to 1·5 per cent. infection of *Alternaria* blight compared with 5 per cent. for Bordeaux with no decrease in yield.

CALLBECK (L. C.). **Current results with Potato vine killers in Prince Edward Island.**—*Amer. Potato J.*, xxv, 6, pp. 225–233, 1 fig., 1948.

Among the potato vine-killers tested at Charlottetown in 1947 dowspray 66 improved and sinox general [*R.A.M.*, xxvi, p. 561 and next abstract] were the most effective. Mixtures of sodium arsenite herbicides with oil (miscible oil, fuel oil, or waste crankcase oil) were equally effective, greatly improving the action of sodium arsenite alone. The premature killing of vines may induce a vascular discoloration in the tubers, the most rapid killers causing the most pronounced effects [ibid., xxvii, p. 493]. Thus tubers treated with dowspray 66 improved were the most severely affected, the amount and intensity of discoloration in tubers increasing with the age of the plants. The greatest injury occurred in those killed late in the season. Tubers from untreated cut vines showed a greater incidence of stem-end discoloration than tubers from untreated control plants, or from plants destroyed by slow-acting herbicides. The vine-killers did not impair the culinary quality of the tubers.

Potato top killers show promise.—*Agric. Chemicals*, iii, 7, pp. 49, 51, 2 figs., 1948.

Tests carried out in the potato-growing areas of Florida, Pennsylvania, Maine, and New York State during the past two seasons showed that single applications of penite 6, a non-selective sodium arsenite weed killer manufactured by the Pennsylvania Salt Manufacturing Company of Philadelphia and Tacoma, Washington, at 4 qts. per 100 gals. water and used at the rate of 80 gals. per acre gave very satisfactory kill of potato haulms [see preceding abstract] prior to harvest. Although kills varied in rapidity with the time of day and weather conditions, the final results were always satisfactory provided that good coverage was obtained. In cases where haulm-growth was very dense a second spray applied after a three- to five-day interval was sometimes found to be necessary. Numerous analyses of treated potatoes indicated that no arsenic was absorbed from sprays of this type.

RAMAKRISHNAN (K. V.). **Studies on the morphology, physiology, and parasitism of the genus Piricularia in Madras.**—*Proc. Indian Acad. Sci.*, Sect. B, pp. 174–193, 1 pl., 11 graphs, 1948.

In this paper the author stresses the interdependence of morphology, physiology, and pathology in the classification of fungal parasites. Studies of four isolates of *Piricularia*, obtained from rice (*P. oryzae*) [*R.A.M.*, xxvii, pp. 443, 494], *Eleusine coracana*, *Setaria italica* (named *P. setariae* by Nisikado) [ibid., vi, p. 637], and *Digitaria marginata*, revealed no appreciable difference in their morphological

characters. The only differences observed were in the nature of infection and symptoms, which were foliar, nodal, and earhead in rice and *E. coracana*, and foliar only in *D. marginata* and *S. italica*, forming roundish leaf spots in *S. italica* and spindle-shaped ones on the other hosts. The nature of the leaf spots seems to depend entirely on the host, as *E. coracana* when inoculated with the *S. italica* isolate developed spindle-shaped spots, whereas the *E. coracana* isolate on *S. italica* formed roundish spots.

The results of physiological studies indicated that the isolates from rice, *S. italica*, and *E. coracana* hardly differed in their behaviour in culture. The *D. marginata* isolate was distinct from the others in colour, in not favouring cellulose as carbon source, and in being unable to grow in agar media with ammonium sulphate as the nitrogen source: its optimum growth temperature was 15° C. (30° for the other three). Isolates from *E. coracana* and *S. italica* produced the enzyme erepsin, whereas those from rice and *D. marginata* did not.

Cross-inoculation experiments conducted under optimum conditions for infection of the hosts showed that the isolate from rice is distinct from the other three in that it infects no other host but rice [cf. ibid., vi, p. 637]. The isolate from *S. italica* infects its own host and *E. coracana* only; the *E. coracana* isolate infects its own host and *S. italica*. The isolate from *D. marginata* is pathogenic to rice and *E. coracana* in addition to its own host. The four isolates are regarded as physiologic races of *P. oryzae*.

Hansford (C. G.). **The 1947 Oidium season at Dartonfield.**—*Quart. Circ. Ceylon Rubb. Res. Scheme*, xxiv, 1–2, pp. 23–28, 1947.

On the Dartonfield rubber estate, Ceylon, the 1947 season was one of mild to medium attack by *Oidium* [*heveae*: *R.A.M.*, xxvii, p. 449] as measured by the leaf fall sustained, though on late-wintering trees infection was severe. Two to five sulphur dustings over the whole estate probably saved some of the old seedling rubber still in a susceptible condition; more frequent dusting appeared to be uneconomic.

During January minimum temperatures, from 70° to 73° F., were too high for epidemic development, and in February moisture conditions did not greatly favour infection, though the minimum temperature ranged as low as 62°. During March frequent light showers made conditions more favourable for the fungus, and although night temperatures were mostly above 70°, the disease caused defoliation of trees whose foliage had been in a suitable condition in the first ten days of the month.

In Malaya the view is taken that the comparative freedom from the disease there is due to high temperatures and low daytime humidities during refoliation. In Ceylon it is becoming apparent that humidity is much the more important, at least in the low country, and that, given suitable ranges of humidity for long periods, the fungus can cause important damage even when the temperature is too high for optimum growth. In the higher parts of Ceylon the night temperatures assist the fungus to attain maximum development and here the disease is much more dangerous and difficult to control.

It has been generally accepted that *O. heveae* remains dormant in the buds and that as they develop the fungus develops with them and becomes able to infect the young leaves on a wide scale if conditions are favourable. The author considers this theory doubtful as the fungus would then be able to grow along the developing stems and leaves and cover them every year with its colonies. But he has found no trace of such growth, the first sign of infection being when the young shoots are about an inch long. At a later stage the fungus is able to attack and kill the flowers and the stems bearing them. It is evident, therefore, that the fungus is not necessarily unable to attack young stem tissue, and its absence from the developing branches would appear to indicate that it is not present in the buds

When bare branches were bagged in two experiments all the leaves and shoots that developed inside were free from infection, though all those outside on the same trees developed the disease. The author considers that it is now sufficiently established that the annual infection epidemic originates from outside the individual trees infected and is air-borne. At present the only method of control is by protective sulphur dusting. In the Kalutara district it is doubtful whether this is economic over a long period of years, though in epidemic seasons it certainly minimizes the damage. In other localities, especially at higher elevations, regular and frequent sulphur dusting remains essential, and where efficiently carried out gives commercial control.

At present *O. heveae* is not a serious menace in the low-lying parts of Ceylon; in fact, a mild attack does good, since it controls seed production and reduces later damage by *Phytophthora* [*meadii* and *P. palmivora*]. In the higher regions, however, the disease is a major factor in production, and many estates in these areas may probably turn over in time to other crops.

The search for more resistant clones must be continued, though only Asiatic material is available at present. Late-wintering varieties which do not suffer much from leaf shedding are more likely to be of value over wide areas in Ceylon than varieties which winter early, because in some seasons the danger period may begin early in the wintering season, and even early-wintering clones might then suffer severely.

The sooner the whole of the old seedling rubber in Ceylon is replaced by budded clones the better, from all points of view. The seedling areas show such a wide range of types, and wintering is so prolonged that some trees are bound to suffer severely. It is uneconomic to make repeated sulphur applications to fields in which most of the trees have successfully passed the danger period in order to prevent severe damage on 20 per cent. or less of those that winter late. Polyclone blocks should, therefore, be avoided; the greater part of each estate should be planted with one or two clones in monoclone blocks. Dusting will then be required for large areas all in the same stage of refoliation, and will entail a minimum of trouble and expense. Other things being equal, there is clearly much advantage in choosing early-wintering clones for planting. In this respect the high-yielding clone P.B. 6/9 is likely to suffer severely under Ceylon conditions from its very late wintering and its liability to severe attack by *O. heveae*, which may outweigh any advantage of yield capacity. With a market completely dominated by outside sources of supply, it has become imperative for Ceylon growers to concentrate on low costs of production.

Quastel (J. H.), Hewitt (E. J.), & Nicholas (D. J. D.). **The control of manganese deficiency in soils. 1. The effects of sulphur and thiosulphates on crops growing on manganese deficient soils.**—*J. agric. Sci.*, xxxviii, 3, pp. 315–322, 1948.

Experiments were carried out to determine the effect of thiosulphates and sulphur on the incidence of manganese deficiency using manganese-deficient soils.

The addition of sodium or calcium thiosulphate to oat plants growing in a manganese-deficient Cambridgeshire fen soil in boxes resulted in a considerable, but only temporary, reduction of grey speck symptoms and increase of manganese content in the tissues. Beet grown in this soil in clay pots responded to thiosulphate treatments particularly when they were applied to pots painted externally with bitumen paint, or when a thin layer of sand was added to the soil surface. The manganese deficiency symptoms were reduced and the manganese uptake of the plants increased.

In field experiments also the addition of thiosulphates to old market garden soil in the Bristol area deficient in manganese increased the manganese content of beet.

Placement treatments were more effective than broadcast ones and markedly improved the growth and reduced or eliminated manganese deficiency symptoms without altering the soil pH. Broadcast dressings of thiosulphates severely injured peas, but even so increased the soluble manganese content of the tissues. Placement applications of sulphur had a beneficial effect on the growth of beet in manganese-deficient soil and increased the manganese content of both beet and pea. Manganese deficiency symptoms in beet were greatly reduced and soil pH was also considerably lowered.

The results of these preliminary tests indicate that the placement of sulphur and sulphur-containing compounds present considerable possibilities for the control of manganese deficiency for some crops.

Isaac (I.) & Keyworth (W. G.). **Verticillium wilt of the Hop (Humulus lupulus). III. A study of the pathogenicity of isolates from fluctuating and from progressive outbreaks.**—*Ann. appl. Biol.*, xxxv, 2, pp. 243–249, 1 pl., 1948.

In further investigations into *Verticillium* wilt of hops (*V. albo-atrum*) [*R.A.M.*, xxvii, pp. 160, 296] a study was made of the pathogenicity of isolates of the fungus from outbreaks of both the progressive and the fluctuating forms of the disease [cf. ibid., xviii, p. 709]. Two preliminary experiments were made in 1944, using naturally infected stems collected the previous autumn from three gardens with progressive and three with fluctuating wilt. The stems were chopped into 1-in. lengths and stored in dry conditions during the winter. One experiment was carried out on sandy loam at East Malling and the other on heavy silt loam at Beltring, near Paddock Wood. Twenty Fuggle plants were grown in soil to which 10 gm. of one of the six types of stem had been added, with 40 similar plants in uninoculated soil. Wilt symptoms appeared in June, the evidence indicating that the addition to the soil of stems from progressive outbreaks caused severe wilt in 89 plants in both localities, while stems from fluctuating outbreaks caused mainly mild symptoms. Also, there were more plants severely wilted or wilted (as compared with those with mild wilt and apparently unaffected) at Beltring than at East Malling, but the same differences between the treatments were apparent at both centres. All the uninoculated plants remained healthy.

In 1945 the types of soil inoculum used were (*a*) naturally infected stems, (*b*) cultures of the fungus on sterilized hop stems grown from portions of naturally infected stems, and (*c*) similar cultures from previously isolated and identified agar cultures. All three types were made from two progressive and two fluctuating outbreaks. Fresh sites were selected in the 1944 fields. The results obtained both at East Malling and Beltring indicated that almost all the inoculated plants became infected, that almost all those inoculated with strains of the fungus from progressive outbreaks showed severe wilt, while most of those inoculated with strains from fluctuating outbreaks showed little or no wilt, and, finally, that the type of inoculum used did not affect the intensity of symptoms produced by any strain.

In June, 1944, Fuggle hops at East Malling and Beltring, planted the previous March, were inoculated with *V. albo-atrum* from fluctuating and progressive outbreaks (*a*) by inserting a portion of agar culture into a scalpel wound in the stem at ground level and covering the base of the plant with soil, and (*b*) by injecting about 0·5 c.c. concentrated spore suspension into a stem at a distance of 3 ft. from the ground. Though many of the inoculated plants became infected and developed brown wood [loc. cit.], no severe wilt appeared, and there was thus no differentiation between the fluctuating and progressive strains. A further experiment was made in 1945 on the same lines but using portions of naturally infected stem and spores from such stems as inoculum, as well as agar cultures and their spores. The results in this instance showed that while there was slightly more wilt in the plants

inoculated with the progressive strain than in those inoculated with the fluctuating strain, the differences were not comparable with those resulting from soil inoculation.

In 1946 at East Malling groups of four plants were inoculated, two with progressive and two with fluctuating strains of the fungus, by introducing portions of pure cultures on hop bine, or spores from such cultures, into the roots and stem bases of Fuggle hop sets before planting in March. All the treatments gave a high proportion of infected plants (as indicated by the brown wood test), but no marked differences in incidence were noted as between root and stem or wound and injection inoculations. Of 32 plants inoculated with progressive strains 29 became infected; of these 17 were severely wilted, two showed some wilt, and seven were mildly affected. The corresponding figures for the same number of plants inoculated with fluctuating strains, were 29, none, 1, and 19.

It is evident that the fluctuating strains used as inoculum throughout the work were less pathogenic strains. It would appear to be a valid assumption that the chief distinction between the two types of outbreak in established gardens lies in the strain of *V. albo-atrum* involved. Soil factors may, perhaps, be partly responsible for differences in the severity of outbreaks, and possibly further strains of *V. albo-atrum* may exist.

Sreenivasaya (M.). **The spike disease of Sandal.**—*Curr. Sci.*, xvii, 5, pp. 141–145, 1948.

Most of the work mentioned in this condensed survey of the present state of research on spike disease of sandal [*R.A.M.*, xx, p. 133; xxii, pp. 276, 371] have already been noticed in this *Review* but the following points may be mentioned. Sandal possesses (1) an autogenic resistance, which is largely independent of the nature of the host, many sandal strains remaining healthy in severely infected areas, and (2) an acquired resistance, exhibited when specific hosts are provided under certain environmental conditions, incidence and spread being dependent upon the floristic composition of the area. Based on these facts two areas have been established in North Salem, using resistant sandal strains, reinforced by hosts which impart relative immunity to sandal [ibid., xiv, p. 478]. Some additional hosts with similar properties are *Cassia siamea*, *Casuarina*, *Melia indica*, *Dodonea viscosa* [ibid., xi, p. 382], *Semicarpus anacardium*, *Ficus bengalensis*, *Sarcostemma brevistigma*, and *Ruta graveolens*. On the other hand, in addition to hosts already noticed [loc. cit.], pigeon pea, *Pongamia glabra*, *Divi divi*, and *Ocimum sanctum* render sandal particularly susceptible to the disease. At Javalgiri grafting experiments under silvicultural conditions resulted in 80 per cent. infection, while in another area similar operations completely failed. This discrepancy is explained by the different floristic composition of the two areas.

In pot culture studies sandal-host combinations growing in large pots were more resistant than those in small ones. Deep-rooted hosts are beneficial to sandal and generally impart immunity from spike. When parasitism is severe, however, sandal restricts the regeneration of the host's root system and this should be strictly avoided by judicious thinning. Pot culture studies also showed that sandal succumbs to the disease more quickly when deprived of the host, and all the host resources in sandal-growing areas should therefore be conserved. Sandal plants kept continuously under shade are more susceptible than those exposed to the sun. Actual infection with sandal spike occurs during April and May, when scars and other injuries, the agents of which are still undetermined, are severely inflicted.

Effective artificial transmissions through haustoria [ibid., ii, p. 380] did not exceed 8 per cent., and the spread of the disease under silvicultural conditions appears to be negligible. Protection against fire and prompt weeding of all species showing symptoms of spike disease are also recommended.

Stevenson (E. C.). **Results of seed-treatment tests with Castor Bean.**—*Plant Dis. Reptr*, xxxii, 7, pp. 295–298, 1948. [Mimeographed.]

All the fungicides used at Beltsville, Maryland, as seed treatments for castor beans [*Ricinus communis*: *R.A.M.*, xxiv, p. 248] from 1943 to 1947 increased emergence when used at 2 oz. per bush., arasan [loc. cit.], ceresan M, and dow 9 being especially outstanding.

The yield data taken showed that seed treatment had no effect on the yield when the stands were comparable; increases occurred only when the differences in stand, as a result of treatment, were great. Since poor stands are very common in castor bean plantings, annual seed treatments are advisable.

Preston (D. A.). **Host index of Oklahoma plant diseases, supplement, 1948.**—*Plant Dis. Reptr*, xxxii, 9, pp. 398–424, 1948. [Mimeographed.]

This host index gives the available information on the occurrence and distribution of 39 additional plant diseases recorded in Oklahoma [*R.A.M.*, xxv, p. 75; xxvii, p. 248.]

Viennot-Bourgin (G.). **Les charbons et les rouilles des Îles Atlantiques. I. Les Ustilaginales des Îles Atlantiques.** [The smuts and rusts of the Atlantic Islands. I. The Ustilaginales of the Atlantic Islands.]—*Mém. Soc. Biogéogr.*, viii (Contribution à l'Étude du Peuplement des Îles Atlantides), pp. 437–441, 1946. [Received September, 1948.]

After a brief note on the geography, climate, and vegetation of the Madeira Islands, the author lists some of the more important Ustilaginales found locally. In addition to some already noticed [*R.A.M.*, xix, p. 365], these include *Sphacelotheca andropogonis* [cf. ibid., xviii, p. 11] on *Andropogon hirtus*.

Guyot (A. L.) & Viennot-Bourgin (G.). **II. Les Urédinales des Îles Atlantiques.** [II. The Uredinales of the Atlantic Islands.]—*Mém. Soc. Biogéogr.*, viii (Contribution à l'Étude du Peuplement des Îles Atlantides), pp. 443–446, 3 figs., 1946. [Received September, 1948.]

The Uredinales found in the Madeira and Canary Islands include, in addition to those already noted [*R.A.M.*, xix, p. 365], *Uromyces betae* [? on beet].

Costa (A. S.). **Mancha aureolada e requeima das folhas do Fumo causadas por Corticium solani.** [Halo spot and leaf scorch of Tobacco caused by *Corticium solani*.]—*Biológico*, xiv, 5, pp. 113–114, 1 pl., 1948.

A foliar disease of tobacco seedlings caused by *Corticium solani* in São Paulo, Brazil, was described by the author and Amaral in *Rev. Agric. Piracicaba*, xiv, pp. 389–397, 1939 [cf. *R.A.M.*, xxi, p. 246]. In 1941, older plants growing in frames for the observation of virus diseases were attacked by the same fungus, which produced on the foliage large, areolate, coalescent lesions. Infection proceeded from the base upwards, gradually involving nearly all the leaves; the older lower ones remained hanging from the stem.

The strain of *C. solani* responsible for the leaf scorch does not appear to differ significantly from *C. aureolatum*, described by Stahel as the agent of areolate leaf spot of citrus [ibid., xix, p. 240], but the results of preliminary inoculation experiments with the former organism on oranges were negative.

Tisdale (W. B.). **Pepper downy mildew in Florida.**—*Plant Dis. Reptr*, xxxii, 4, p. 130, 1948. [Mimeographed.]

At the beginning of March [chilli] pepper plants in Florida planted some distance away from tobacco beds were found to be affected by a downy mildew apparently

identical with *Peronospora tabacina* [*R.A.M.*, xxvii, pp. 163, 175]. Conidiophores were abundant on some leaves and a few plants were completely killed. The author states that in previous years chilli plants were observed to remain quite healthy in beds of tobacco killed by blue mould.

Horowitz (B.), Croll (R. D.), & Bell (T. C.). **Nicotiana rustica as an Australian field crop.**—*J. Aust. Inst. agric. Sci.*, xiv, 2, pp. 61–70, 5 figs., 1948.

Research at the University of Sydney having demonstrated that *Nicotiana rustica* is the most desirable source of nicotine with a high yield of alkaloid per acre, the Australian Department of Commerce and Agriculture requested a private firm to undertake large-scale field production and the manufacture of nicotine sulphate. A major campaign was begun in 1946 with a large acreage in New South Wales, Victoria, and Queensland.

The season 1946–7 was excellent for tobacco and *N. rustica*, but in 1947–8 the Ovens Valley experienced an exceptionally severe epidemic of blue mould [*Peronospora tabacina*: *R.A.M.*, xxvii, pp. 48, 163, 175], and though far less damage was caused to *N. rustica* than to tobacco, the yield was considerably reduced.

Horsfall (J. G.). **An unusual occurrence of Tomato blossom-end rot.**—*Plant Dis. Reptr*, xxxii, 8, p. 351, 1948. [Mimeographed.]

In July, [? 1948], the author observed an unusual case of blossom-end rot [*R.A.M.*, xxv, p. 479; xxvi, p. 136] on tomatoes growing in very humid soil and under cool conditions in a field of Earliana. The disorder was induced after a short hot spell with drying winds, and it appears that the roots had not been forced to extend themselves because of the high moisture content of the soil.

Chamberlain (E. E.). **Tomato streak.**—*Bull. N.Z. Dep. sci. industr. Res.* 281, 11 pp., 5 figs., 1947.

Streak, which produces severe streaking of tomato leaves, stems, and fruit, and a less obvious mosaic mottling of the foliage in New Zealand is caused by a strain of tobacco mosaic virus [*R.A.M.*, xx, p. 502; xxvi, p. 425]. It can also infect tobacco, chilli, pepper, eggplant, *Physalis peruviana*, and *Solanum nigrum*, of which the last two are most likely to be of significance in spreading the disease. Small-scale trials have shown that the disease is carried in the testas of uncleaned seed. Three plants out of 600 raised from seed from infected plants developed infection. Of 357 plants grown from seed cleaned by adding 1 oz. concentrated hydrochloric acid per 6 lb. of fruit pulp, allowing to stand for two hours, and washing in water to remove the gelatinous seed-coats before drying, none developed streak. The disease can also be introduced through the use of contaminated soil in seed- or seedling-boxes. This can be remedied by steam disinfection or by using soil not planted with susceptible hosts for at least two years. The viruses of both streak and tomato mosaic [tobacco mosaic virus] are carried over in the soil either in plant débris or in the free state, leaching out from the roots and stems of infected crops. Recommendations are given for general hygiene to prevent infection through handling and to minimize infection in plantings which are already diseased. The planting of healthy seed away from other hosts of the viruses, the removal of diseased plants from the crop, and the destruction of plant débris at the end of the season should serve to keep down the disease as much as possible.

Sutton (W. S.). **Early blight or target spot of Tomatoes.**—*Agric. Gaz. N.S.W.*, lix, 6, pp. 297–300, 6 figs., 1948.

Early blight (*Alternaria solani*) is the most serious tomato disease in the coastal and some inland areas of New South Wales [*R.A.M.*, xxi, p. 309; xxiv, p. 252] during autumn months. In addition it is commonly found on potatoes, eggplants,

and many common weeds, including nightshade (*Solanum* spp.). A brief description is given of the symptoms of the disease on seedlings and stems and leaves on plants in the field. The fungus is incapable of attacking the fruit except in the region immediately adjacent the fruit stalk scar. From the point of attack the fungus penetrates deeply into the fruit as a rounded black mass, causing an external depression resembling the imprint of a thumb in shape and size. Control measures, most of which have already been noticed in this *Review* [ibid., xxvi, pp. 425, 472; xxvii, p. 174], include seed treatment with hot water at 122° F. for 25 minutes [ibid., xxiii, p. 371] and dusting of the seed with cuprox, oxicop, soltosan, agrosan, ceresan, or semesan; selection of soil virgin to tomatoes for the seed-bed; thin planting and prompt weeding; spraying of seedlings with Bordeaux mixture 2–2–40 as soon as the first true leaves have formed and then at weekly intervals, followed by a Bordeaux spray (1–1–40) a day or two after transplanting and then at 10-day intervals; rotation of at least two years; and crop sanitation.

Brock (R. D.). **The nature of Fusarium wilt resistance in the Tomato variety Pan America.**—*J. Aust. Inst. agric. Sci.*, xiv, 2, pp. 78–80, 1948.

Observations on Pan America tomato plants inoculated with *Fusarium bulbigenum* var. *lycopersici* [*R.A.M.*, xxvii, p. 454] showed that vascular browning can occur in the roots of plants which do not wilt. The fungus can be reisolated from apparently healthy roots and those with vascular browning. Isolations from the roots of a Pan America hybrid showing field immunity also yielded the organism. Vascular browning did not extend into the above-ground portion of these plants, and attempted reisolations from the stems were unsuccessful. Pathogenicity tests with these isolates demonstrated that they were of the same order of pathogenicity as the strain used for glasshouse inoculations, i.e., the highly pathogenic strain used by Mills and Hutton [loc. cit.]. Hence, though the normal pathogenic strain can effect entry into the roots of the field-immune tomato plant, its growth and ability to cause wilting are checked, a state of equilibrium being reached, apparently, between the plant and the pathogen.

Pan America plants inoculated with *F. bulbigenum* var. *lycopersici* were inoculated, 13 days later, with the tomato spotted wilt virus or potato virus X. Of 32 plants inoculated with *F. bulbigenum* var. *lycopersici* only, 19 had no vascular browning, 11 showed vascular browning of the root area, and in two, classed later as susceptible, it extended only to the cotyledons, these two plants showing no external wilt symptoms 28 days after inoculation. Of 46 plants inoculated with *F. bulbigenum* var. *lycopersici* and tomato spotted wilt, all showed vascular browning; 30, classed as resistant, showed vascular browning of the root area, while in the remainder (susceptible) it extended into the stems. Of 41 plants inoculated with fungus and potato virus X, 38 were resistant and 3 susceptible. The evidence indicates that Pan America is resistant because it is able to check the growth of the pathogen rather than prevent entry or confine the fungus to the root system. The addition of the tomato spotted wilt virus reduces host resistance, with the result that the fungus spreads to the above-ground parts of the plant. This effect was less marked with potato virus X.

Roland (G.). **Les virus des taches bronzées de la Tomate (Lycopersicum virus 3, Brittlebank) et de la mosaïque du Concombre (Cucumis virus 1, Doolittle) sur Dahlia.** [The viruses of Tomato spotted wilt (*Lycopersicum* virus 3, Brittlebank) and Cucumber mosaic (*Cucumis* virus 1, Doolittle) on Dahlia.]—*Parasitica*, iv, 2, pp. 98–102, 7 figs., 1948. [Flemish summary.]

The author briefly describes the symptoms observed on different dahlia varieties grown in the open in Belgium in 1947 and naturally infected with the tomato spotted wilt virus or cucumber mosaic [cf. *R.A.M.*, xxvii, pp. 187, 421], the

viruses being identified by inoculation tests. The ring spots and zigzag lines observed on the leaves of certain varieties would appear to be attributable to the tomato spotted wilt virus, but other varieties, although infected by this virus, did not have characteristic symptoms. The symptoms also varied with the period when the observations were made, while in some instances they disappeared at the end of the summer. It would appear that cucumber mosaic virus can remain in the latent state in infected dahlias.

The author concludes from these observations that the symptomatology of dahlia virus diseases is highly complex, and becomes even more so when the different strains of each virus are taken into consideration. In view of this, and of the frequent occurrence of latency, no strict selection of healthy dahlias is possible without laboratory confirmation.

Sibilia (C.). **Le virosi nelle specie forestali.** [Virus diseases of forest trees.]—Reprinted from *Ital. for. mont.*, ii, 2, 8 pp., 1947.

The author briefly reviews and discusses a number of records in the literature of virus diseases affecting forest trees in Italy and elsewhere. Much of the information given has already been noticed from other sources [cf. *R.A.M.*, xii, p. 405; xvii, p. 543; xxiii, p. 244, *et passim*].

Pavari (A.). **La lotta contro un nuovo flagello dei nostri castagneti (Endothia parasitica).** [The control of a new scourge of our Chestnut groves (*Endothia parasitica*).]—Reprinted from *Atti Accad. Georgof. Firenze*, 19 pp., 1 map, 1947.

After noting the rapid spread of chestnut blight (*Endothia parasitica*) [*R.A.M.*, xxvii, p. 265] in Italy since 1938 the author reviews and discusses in relation to the problem of control the data obtained by him in recent visits to the United States and Spain. In America, the view is taken that the Asiatic chestnuts *Castanea mollissima* and *C. crenata* [ibid., xxv, p. 15; xxvi, p. 176] should be grown experimentally under good conditions to ascertain if good results are obtainable from them. American workers consider that the best means of control lies in developing Asiatic×American hybrids which combine the timber qualities of the American chestnut varieties with the disease resistance of the Asiatic. The early hybrids made in 1909 in the United States between the American varieties *C. dentata* and *C. pumila* and the Asiatic varieties *C. mollissima*, *C. seguinii*, and *C. crenata* were nearly all dead by 1937. Further hybrids made in 1939 [ibid., xxiii, p. 320] from *C. hozarkensis*, *C. floridana*, *C. alabamensis*, *C. ashei*, and other species crossed with *C. mollissima* and *C. crenata* almost all showed insufficient resistance, though better resistance was displayed by hybrids obtained by using the Asiatic species as pollen parents than by hybrids of different origin. Back-crossing to the Asiatic parents has thus given hybrids combining very good resistance with other desirable qualities. Still further crossing is considered necessary to obtain hybrids with more reliable resistance.

It is considered that in Italy curative measures might still, if attempted, give good results. It is possible that some varieties, clones, or individuals of *C. sativa* resistant to the disease may be found in Italy. Many types of *C. mollissima* found unsuitable in the United States as timber might prove very suitable in Italy for fruit production. Hybridization should at once be undertaken on the largest possible scale in Italy and every effort should be made to introduce *C. mollissima* in the pure state, as it offers the best guarantee of immunity. The importation for experimental growing on a large scale of this species, hitherto not grown in Italy, has now begun.

A programme for control in Italy is put forward. Curative methods are being carried out, using various fungicides, especially copper and iron salts. Tests with chemical fertilizers are also in progress. In the search for resistant strains of *C.*

sativa over 120 varieties of this species have been planted in a nursery in the province of Genoa for experimental inoculations. Similar work will, it is hoped, be carried out in central and southern Italy.

In northern Spain, where large plantings of Asiatic chestnuts are being grown experimentally, the author found *E. parasitica* (or a fungus apparently identical with it) on almost every individual of the Shiba and Tamba varieties of *C. crenata*. The fungus was not, however, observed on indigenous chestnuts growing in the immediate vicinity of the affected trees, with the exception of one tree which had been attacked at the base, but had reacted vigorously with callus formation and seemed perfectly healthy. The Japanese trees had been affected for at least 15 to 20 years, and the disease was still progressing on them.

The only Asiatic chestnut that has been grown in Italy for any length of time is *C. crenata* and its resistance has been found very unreliable. *C. mollissima*, however, shows almost complete resistance, is much prized for its fruit, and appears to be better adapted to Italian ecological conditions. The author observed large plantings of the Korean chestnut (probably nearer to *C. mollissima* than to *C. crenata*) in Spain which were perfectly healthy though growing in close proximity to affected Japanese chestnuts. Hybridization work between *C. mollissima* and *C. sativa* and *C. crenata* has been started.

Treggi (G.). **Il 'cancro della corteccia del Castagno' nell' Appennino Pistoiese.** [Chestnut bark canker in the Pistoja region of the Apennines.]—*Ann. Fac. agr. Pisa*, N.S., viii, pp. 254–257, 2 figs., 1947.

During 1944 chestnut bark canker (*Endothia parasitica*) [see preceding abstract] was reported for the first time from the Pistoja region of the Apennines, one of the most important chestnut-growing areas in Italy. In 1945 about 30 per cent. of the chestnut trees in the commune of Cutigliano were affected, while spread had continued in many directions. At Le Cane, where the first infection was found in 1944, four to five hectares of chestnuts were completely destroyed by the disease in 1945. By 1947 the disease had spread over the whole commune of Cutigliano and a great part of several others in the vicinity, comprising an area of about 3,500 hectares. Infection reaches 60 to 70 per cent. and mortality averages 45 per cent.

Poplar planting.—*Leafl. For. Comm., Lond.*, 27, 14 pp., 7 figs., 1948.

In this pamphlet on poplar cultivation in Great Britain it is stated that among the diseases of poplars bacterial canker [*R.A.M.*, xxvi, p. 221], caused by several bacteria acting together, is the most destructive and can only be prevented by the use of resistant varieties such as *Populus nigra italica*, *P. n. plantierensis*, *P. gelrica*, and *P. robusta*. Die-back, usually associated with *Dothichiza populea* [ibid., xxv, p. 586; xxvi, p. 431], is less serious but quite common on fastigiate types. *Cytospora chrysosperma* [ibid., xxi, p. 99] is non-pathogenic and occurs frequently on dead poplar wood. Rust (*Melampsora* spp.) [ibid., xxv, p. 145] varies in severity from year to year, but is never sufficiently severe to bar cultivation except of very susceptible types such as *P. generosa*.

Miller (P. W.). **Further investigations on the control of Walnut blight by dusting.**—Reprinted from *Proc. Ore. St. hort. Soc.*, xxxix, pp. 114–115, 1947.

The results of further tests for the control of walnut blight [*Xanthomonas juglandis*: *R.A.M.*, xxvii, p. 104] in Oregon in 1947 showed that six applications in a Franquette orchard with the following dusts: copper+lime+oil (20–40–1·5), copper+lime+sulphur+boric acid+oil (20–43·5–10–25–1·5), and yellow cuprous oxide+sulphur (6–15) at approximately weekly intervals beginning in the early pre-blossom stage, reduced the incidence of the disease from 36·2 per cent. to 3·5, 5, and 5·1 per cent., respectively. Under the same conditions four applications of the

first dust only reduced the incidence to 28·2 per cent. Most growers who had made five or more applications obtained good to excellent control. For example, five applications of a copper+lime+sulphur+oil (20–40–10–1·5) dust, timed similarly, reduced the number of infected nuts from 41·1 to 2·6 per cent., four applications reducing it to only 17·4 per cent.

Twenty-eighth Annual Report of the Forestry Commissioners for the year ending September 30th, 1947.—68 pp., 11 maps, 1948.

On p. 39 of this report it is stated that the results of investigations into the death of pines in East Anglia associated with *Fomes annosus* [*R.A.M.*, xxv, p. 482] obtained so far indicated that infection occurs mainly through root contact and that the stumps of trees removed in early cleanings constitute a serious source of infection. The disease tends to be aggravated by alkaline soils.

Other maladies studied during the year included the dying back of pines on calcareous soils, *Phaeocryptopus gaeumannii* on Douglas fir [*Pseudotsuga taxifolia*], and *Keithia* [*Didymascella thujina*: ibid., xxvi, p. 222; xxvii, p. 463] which seriously damages nursery plants of western red cedar (*Thuja plicata*). A survey of [Dutch] elm disease [*Ceratostomella ulmi*: ibid., xviii, p. 640; xxi, p. 440] revealed an unexpected spread northwards over the Scottish border. Hitherto no major outbreaks north of a line from Chester to York had been discovered.

Wallace (G. B.). **Bacterial soft rot of vegetables.**—*E. Afr. agric. J.*, xiv, 1, pp. 34–35, 3 figs., 1948.

Soft rot caused by *Bacterium carotovorum* [*Erwinia carotovora*] has been observed in the Northern and Southern Highlands Provinces of Tanganyika Territory in turnip (losses up to 20 per cent.), carrot, cabbage, cauliflower, Brussels sprouts, and celery. Information is given to growers on the incidence, host range, symptoms, and control [*R.A.M.*, xix, p. 58; xxii, p. 343; xxiv, p. 304].

Leyendecker (P. J.). **The occurrence of Cabbage yellows in Southern New Mexico.**—*Plant Dis. Reptr*, xxxii, 8, p. 346, 1948. [Mimeographed.]

Fusarium oxysporum f. *conglutinans* [*F. conglutinans*: *R.A.M.*, xxv, p. 148] was isolated from several diseased cabbage plants in New Mexico, the original field in the southern part of the country revealing 5 to 10 per cent. of infection. This is the first record of the incidence of cabbage yellows in this area.

Henderson (R. F.). **Vegetable seed certification and approval schemes. List of growers for 1947–48 season.**—*J. Dep. Agric. Vict.*, xlvi, 7, pp. 301–302, 1948.

Lists are given of the growers of certified seed of French bean [*Phaseolus vulgaris*] and approved pea and tomato seed for the 1947–48 season in Victoria. The five bean seed crops grown in East Gippsland which reached the required standard showed no evidence of halo blight (*Pseudomonas medicaginis* var. *phaseolicola*) [*R.A.M.*, xxvi, pp. 372, 373], *Xanthomonas phaseoli* [loc. cit.], or anthracnose (*Colletotrichum lindemuthianum*) during inspection and contained no more than 5 per cent. bean mosaic [ibid., xxv, p. 22] after the first inspection. Approximately 700 bushels of certified Brown Beauty will be available for growers for sowing in East Gippsland in the coming season. It is hoped that sufficient stocks of certified seed of all commonly grown varieties will eventually be available for distribution.

The approved pea seed crops from approved parent seed of long satisfactory history showed no trace of bacterial blight (*Pseudomonas pisi*) [ibid., xxvi, p. 1] or *Septoria pisi* [loc. cit.] and were reasonably free from *Ascochyta* blight (*Mycosphaerella pinodes*, *A. pisi*, and *A. pinodella*) [ibid., xxvi, p. 330; xxvii, p. 169]. Approved Greenfeast seed is giving very satisfactory results in many districts both for canning and green peas.

Approved crops of Burwood Wonder, Tatinter, and Victorian Dwarf tomatoes showed no evidence of bacterial canker (*Phytomonas michiganensis*) [*Corynebacterium michiganense*: ibid., xxvi, p. 136] during the growing period, and were also reasonably free from all other diseases. As an additional precaution all approved tomato seed should be submitted to the Department for hot water treatment before sowing.

SEVERIN (H. H. P.). **Transmission of California Aster-yellows virus by leafhopper species in Thamnotettix group.**—*Hilgardia*, xviii, 4, pp. 203–216, 1 col. pl., 1948.

The leafhoppers *Colladonus montanus* and *Friscanus rupinatus* var. *brunneus* in the *Thamnotettix* group have been determined as vectors of California aster yellows virus in addition to those already reported [*R.A.M.*, xxvii, p. 353]. Celery was infected to the extent of 11 per cent. and 23 per cent., respectively, but asters were not. The number of leafhoppers and the period of exposure to healthy plants have an important effect on the transmission.

The minimum latent period in *C. geminatus* males ranged from 11 to 36 days and in *C. montanus* males from 8 to 40 days.

One male *Idiodonus heidemanni* retained the virus for 11 days after producing the initial infection and one female of *C. commissus* retained it for six days producing three infections. Usually, however, adults caused only the initial infection.

PARRIS (G. K.). **Further observations on the inheritance of resistance to Fusarium wilt in Watermelon.**—*Plant Dis. Reptr*, xxxii, 9, pp. 378–379, 1948. [Mimeographed.]

The results of breeding experiments carried out during the last three years at Leesburg, Florida, confirm previous findings [*R.A.M.*, xxi, p. 362] that the F_1 progeny from crosses between watermelon varieties susceptible to *Fusarium* wilt (*Fusarium oxysporum* [*F. bulbigenum*] var. *niveum*) [ibid., xxvii, p. 405] and resistant ones are not always susceptible to the disease. The survival rates of F_1 progeny from the crosses Hawkesbury × Cletex, Blacklee × Cletex, Flaming Delicious × Black Kleckley, and Cannon Ball × Black Kleckley, grown on heavily infested soil were 96, 85, 54, and 0 per cent., respectively. In two instances the survival rates of the F_2 was obtained (55 and 51 per cent.) but the method of inheritance remains undetermined.

LINNASALMI (ANNIKKI). **On the control of Cucumber scab (Cladosporium cucumerinum Ell. & Arth.).**—*Maataloust. Aikakausk.*, xix, pp. 124–128, 1947.

In tests conducted in 1936 and 1945–7 to control cucumber scab [gummosis] (*Cladosporium cucumerinum*) [*R.A.M.*, xxvii, p. 309] in Finland, where it is the most destructive disease of outdoor cucumbers, among the various fungicides tested only copper–lime sprays and sulphur dusts were effective, and these only slightly so.

ATKINS (F. C.). **Major diseases of the cultivated White Mushroom.**—9 pp., 14 figs. Midlands Group Publications, Yaxley, Peterborough, 1948. 2*s*. 6*d*.

This paper, designed primarily for growers, contains useful information on the major diseases of the cultivated white mushroom [*Psalliota* sp.]. The four sections deal, respectively, with bacterial pit (*Pseudomonas fluorescens*) [*Pseudomonas tolaasi*: *R.A.M.*, xxvii, p. 111], and the diseases caused by *Dactylium dendroides* [ibid., xxvi, p. 437; and above, p. 552], *Mycogone perniciosa* [ibid., xxvi, pp. 4, 376], and *Verticillium psalliotae* and *V. malthousei* [ibid., xxvii, p. 110]. Brief notes are given on common names, symptoms, sources of infection, prevention, control and scientific description of the pathogens.

INDEX OF AUTHORS

GENERAL INDEX

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CONTENTS

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SUBJECT INDEX

Ser 4

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CONTENTS

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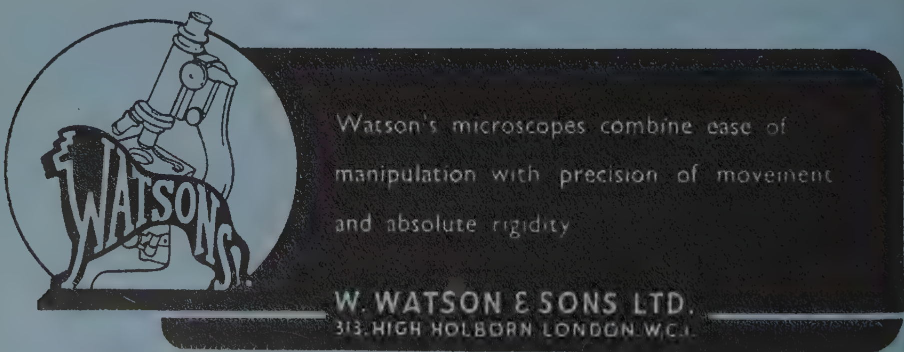

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CONTENTS

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CONTENTS

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THE REVIEW

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MYCOLOGICAL PAPERS

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CONTENTS

AUTHORS' NAMES

SUBJECT INDEX

VOL. XXVII. PART 6 JUNE, 1948

THE REVIEW

OF

APPLIED MYCOLOGY

MYCOLOGICAL PAPERS

No. 21. THE CAUSE OF VARIATION IN THE INCIDENCE OF BLACKARM DISEASE OF COTTON IN THE SUDAN GEZIRA.

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CONTENTS

AUTHORS' NAMES

SUBJECT INDEX

VOL. XXVII. PART 7 JULY, 1948

THE REVIEW

OF

APPLIED MYCOLOGY

MYCOLOGICAL PAPERS

No. 21. THE CAUSE OF VARIATION IN THE INCIDENCE OF BLACKARM DISEASE OF COTTON IN THE SUDAN GEZIRA.

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CONTENTS

AUTHORS' NAMES

SUBJECT INDEX

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CONTENTS

AUTHORS' NAMES

SUBJECT INDEX

ERRATUM

Vol. XXVII, p. 315, l. 2: after 'aphid', insert 'transmitted neither. Aphids'.

VOL. XXVII. PART 9 SEPTEMBER, 1948
(*Issued October, 1948*)

THE REVIEW

OF

APPLIED MYCOLOGY

MYCOLOGICAL PAPERS

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CONTENTS

AUTHORS' NAMES

SUBJECT INDEX

VOL. XXVII. PART 10 OCTOBER, 1948

THE REVIEW

OF

APPLIED MYCOLOGY

CAB

MYCOLOGICAL PAPERS

No. 21. THE CAUSE OF VARIATION IN THE INCIDENCE OF BLACKARM DISEASE OF COTTON IN THE SUDAN GEZIRA.
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CONTENTS

AUTHORS' NAMES

SUBJECT INDEX

VOL. XXVII. PART 11 NOVEMBER, 1948

THE REVIEW

OF

APPLIED MYCOLOGY

MYCOLOGICAL PAPERS

No. 21. THE CAUSE OF VARIATION IN THE INCIDENCE OF BLACKARM DISEASE OF COTTON IN THE SUDAN GEZIRA.

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CONTENTS

AUTHORS' NAMES

SUBJECT INDEX

VOL. XXVII. PART 12 DECEMBER, 1948

THE REVIEW

OF

APPLIED MYCOLOGY

MYCOLOGICAL PAPERS

No. 22. THE CAUSES OF VARIATION IN THE INCIDENCE OF COTTON LEAF CURL IN THE SUDAN GEZIRA.

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CONTENTS

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SUBJECT INDEX

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4/6

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